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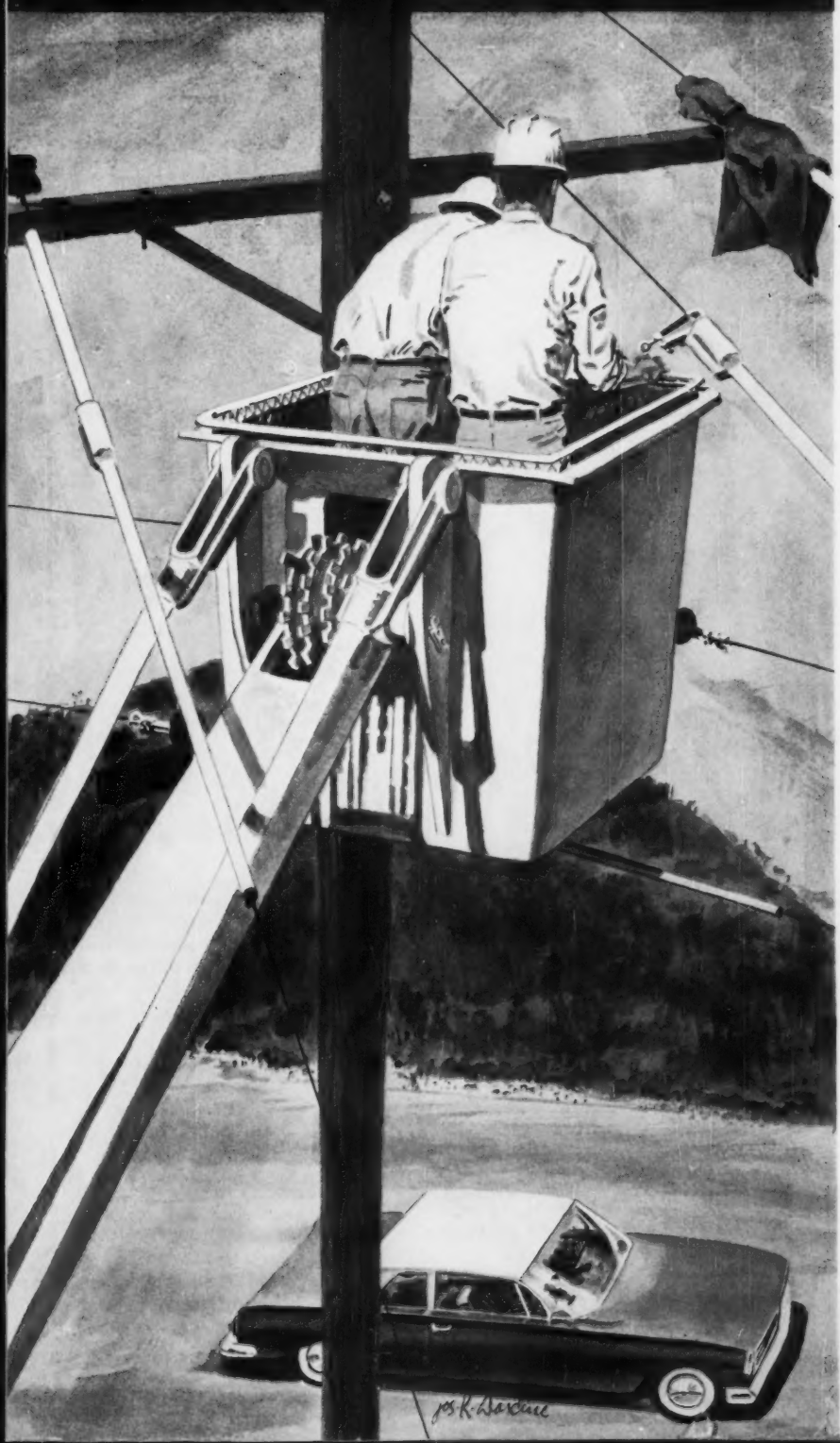
December 18, 1961

Electrical World

Price One Dollar

The Electrical Industry's Weekly Magazine



Last of Six Reports for 1961

E u m

Starts on p 51

'Bare-Hand' Live-Line Technique Works on Distribution Systems

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1958 FIRST with Caliband control

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1940 FIRST Vari-Amp feature

1939 FIRST unit construction

1938 FIRST unidirectional breather

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Electrical World

DECEMBER 18, 1961
Vol. 156, No. 25

Dateline . . .

Saved by the Tinkle of Christmas Bells

Convention Circuit, USA—Each year the tinkle of holiday bells occurs simultaneously with the tingle of returning life to the posterior regions of travel-weary editors. The convention circuit recesses.

Gone for a few weeks is the lulling drone of monotones voicing brilliant ideas carefully set down on paper and then extracted syllable by syllable and amplified through the echoing meeting hall so the man in the last row can enjoy its tranquillizing effect.

With face frozen into a social smile and hands grown stiff with enthusiastic greetings, the editor returns to his cell and faces the accusing countenance of his long-neglected typewriter. The ideas, the philosophies, the logic of months of meetings struggle to come to the surface to be recorded for posterity. But only one thought is predominant: "I heard all the problems. I heard the questions. Where are the solutions and answers?"

As he begins to winnow the wheat to separate the chaff, the editor realizes to what extent electrical industry meetings are subjected to Parkinson's law: The number of papers is governed by the number of blank spots on the program.

And then, perhaps because he is humanly lazy, instead of writing the editor begins to wonder about the meetings themselves. Was there a real need for this meeting or that one? Or was it held because it has always been held? Was the purpose of the meeting worthwhile and clearly stated?

More than 300 electrical industry meetings were held in 1961. The number of man-hours devoted to their planning and attendance is astronomical. Because of this tremendous investment in time and talent, it seems logical that the format of the meetings, and the contents of the talks, should be examined minutely and altered when found wanting in order to send delegates home with answers instead of questions, with tools they will find useful instead of old, still-unsolved problems.

Thinking back over the gatherings of the past year, the editor finds that discussion sessions were usually more fruitful than a single speaker's views. Controversial subjects called for more objectivity and

(*Continued on page 5*)

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Dateline...

Convention Circuit, USA (*Continued from page* 3) consequently produced more answers, and kept more delegates awake. In fact, controversy often expended itself when given an airing. Timely information, as compared with that which had been bottled up in committee for months or years, was nearly always more interesting. The kind speaker who talked to his subject pointedly and as briefly as possible was always better received. And if he was well equipped with visual aids and even average speaking ability, he was a brilliant jewel.

Somewhere, hidden in the whirling color of a convention, is the opportunity to create the image of an alert, well managed industry. The day-dreaming, procrastinating editor is inclined to think that it lies in fearless, open and intelligent discussion. And, if an industry can use improvement, stimulation and idea exchanges of wide-open bull sessions can provide one short-cut to obtain it.

Another question arises out of the brain numbed by high altitude flying and post-session social hours. Is it really necessary to stand up and read a paper that has already been written and reproduced? Couldn't the paper be handed out—or even mailed—before the session and then devote the time to questions and answers—to the kind of intellectual give and take that leads to giant strides instead of baby steps?

Questions, questions, questions. Start your writing, lonely scribe. Shake away the cobweb created in your cranium by a million words spoken by hundreds of devoted, skillful men, standing behind hundreds of flexible, super-duper, chrome-plated microphones. Dig for the answers instead of raising more questions.

And if you cannot get your mind off the questions until they are answered—call a meeting.

Merry Christmas, Merry Christmas, Merry Christmas. Be seeing you at the conventions.

Letters

A Word of Commendation

To the Editor:

Your resume of the Detroit Fall AIEE Meeting on pages 55-57 of the November 20th issue, has prompted me to write my first letter to a magazine.

This was a most excellent job of extracting key points from a multitude of papers and deserves a word of commendation. I have circulated it as a supplement to my own meeting report to everyone in the Department.

H. B. White
Sales Development Engineer
Aluminum Company of Canada, Ltd.

Sporn Questions Efficient System List

To the Editor:

After looking over the tabulation of the most efficient steam-electric plants and systems on page 50 of your November 20 issue I checked the Federal Power Commission release and noted that, contrary to practice for many years, system performance rather than individual power plant performance was featured in the FPC release this year.

I am sorry to see this deviation from past years' reporting. In my judgment, system performance is a poorer indicator of the industry's technological progress than plant performance, since it is affected by the weighted age of the systems generating facilities. It is interesting to note that TVA with its steam plants constructed during or after World War II, has apparently established a record as the most efficient system in 1960 despite the fact that not one of its plants has made the list of the ten most efficient.

But if we are to prepare a list of the most efficient systems in the country, it ought to be an accurate and truthful list. Such a list should show Ohio Valley Electric Corp system in first position, with a heat rate of 9,205 Btu per kwhr; TVA, Duke Power and American Electric Power in second, third and fourth positions; Electric Energy Inc., in fifth place, with a heat rate of 9,707 Btu per kwhr; and then Southern California Edison, Consumers Power, Carolina Power & Light, Niagara-Mohawk, and South Carolina Electric & Gas in

(*Continued on page* 124)

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J-61015

Space-saving, design of SF_6 power circuit breaker places operating mechanism and cabinet below pole units in mounting frame, avoids interference with substation columns. Mechanically-linked pole units are closed pneumatically, opened by spring.

New:

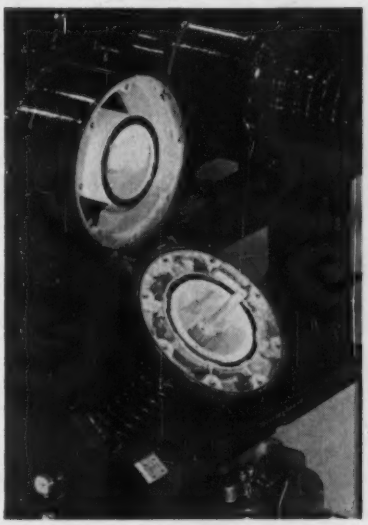
Compact 34.5 and 46kv SF_6 power circuit breakers are lighter, easier to maintain than conventional breakers

Now Westinghouse engineers have extended the revolutionary SF_6 power circuit breaker design to two new ratings—34.5 and 46 kv, 500 mva. This new breaker is a simple, low pressure device which does not require a gas compressor. Like the larger ratings introduced earlier, the new design combines the best features of oil and air blast breakers by taking full advantage of the unique properties of SF_6 gas: high dielectric recovery rate, exceptional dielectric strength and virtually unlimited life of SF_6 gas as an interrupting medium. Result is significant savings in space, foundation and maintenance requirements.

Simplicity of design made possible by the puffer-type interrupter is the key to greatly reduced maintenance. With only *one* set of contacts, *one* interrupter and *one* break per pole, adjustment is easy and there are few parts to wear out. In fact, indications are that these two new SF_6 power circuit breakers can be placed in service on a *five-year or longer maintenance basis.*

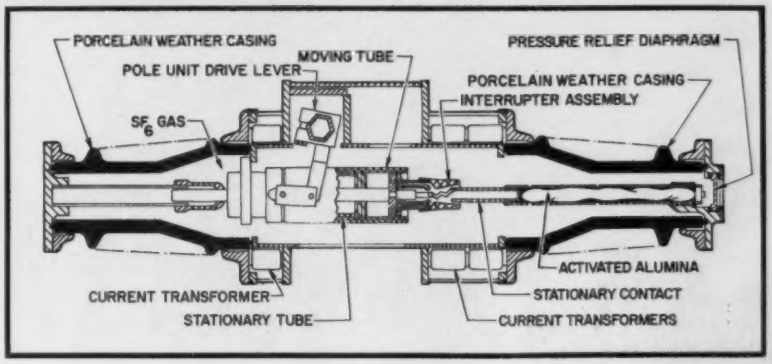
Your Westinghouse representative has complete technical details.

You can be sure . . . if it's Westinghouse



Hinged bushings provide easy access for inspection of contacts and current transformers. Two standard-accuracy current transformers may be mounted on one side of the interrupter and one transformer on the other side. This arrangement provides overlapping relaying protection if desired.

Heart of new, low-voltage design is puffer-type interrupter mechanism, shown here in cross section. Entire unit is filled with SF_6 gas at 45 psig. As breaker opens, cylinder moves to left. This action compresses the gas through an orifice to extinguish arc at tip extension of contact fingers.



Westinghouse

This mark tells you a product is made of modern, dependable Steel.

No maintenance in 56 years

This tower is one of hundreds in the Kern River Transmission Line that has not needed any maintenance since the line was erected in 1905. It was originally built to carry power from the Kern River Power Plant of Southern California Edison Company to Los Angeles, a distance of over 100 miles. In all that time no maintenance has been needed on the steelwork of the tower, although its insulators were changed and concrete footings were placed around the steel below ground surface. The towers are constructed of 4″ x 4″ x 5/16″ carbon steel angles, hot-dip galvanized for corrosion protection. These angles were rolled by Carnegie Steel Company, now part of United States Steel Corporation.

Nothing is as economical as steel. Only steel gives lower first cost plus long-term economy. Steel structures are easy to erect and go years without maintenance. Design with steel for proven dependability and years of satisfactory service. For more information, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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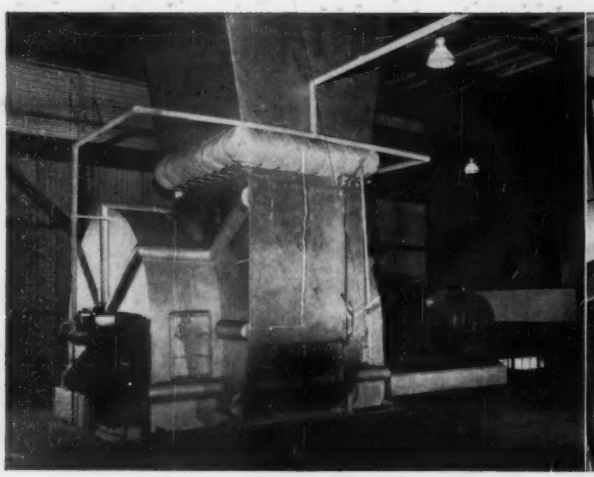
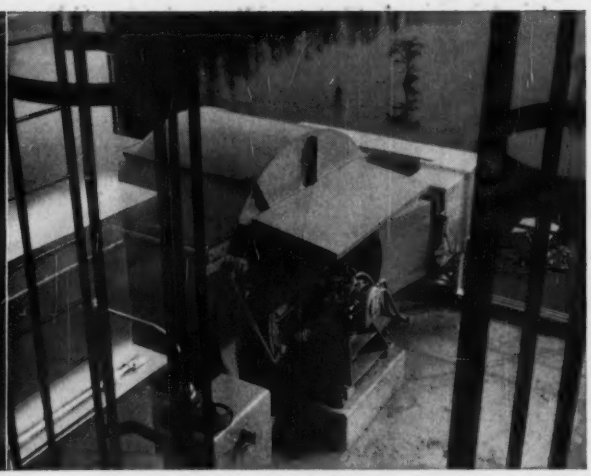
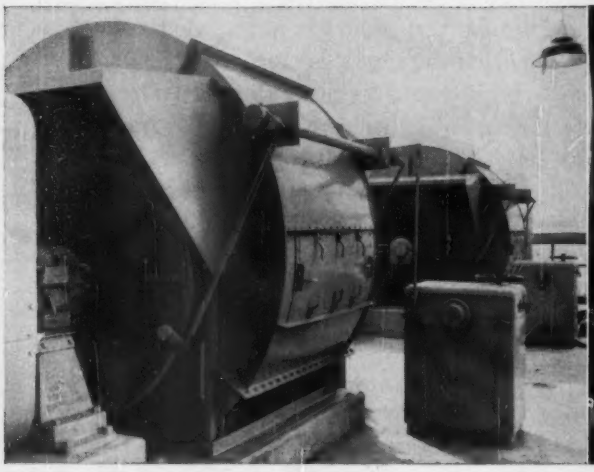
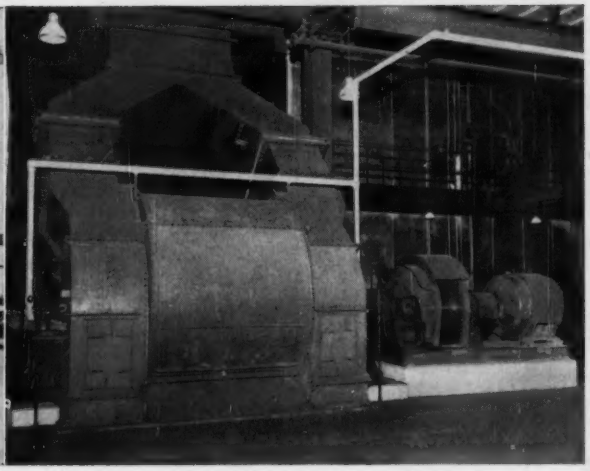
TRADEMARK





PERFORMANCE...





the practical measurement of fan economy

Like all capital equipment, the true economy of mechanical draft fans can be measured only in terms of performance.

"Lowest" initial cost and "promised" ratings are poor, often *costly* criteria.

'Buffalo' heavy-duty fans are quality-engineered to perform "as specified." Because of this engineering, 'Buffalo' fans use less power . . . require less maintenance . . . deliver extra years of efficient service in the most punishing of mechanical draft uses.

As a result, the economy of 'Buffalo' fans can be accurately measured by actual year-to-year savings in power, maintenance, and replacement costs.

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CHAFING DAMAGE?

Fig. 1.

This badly abraded tie wire was removed and photographed during an inspection of the tie points on an undamped distribution line in a northwestern state. The line (1/0 ACSR - 6/1) was constructed in the Spring of 1959 and the utility made an inspection 17 months later. The damage was attributed entirely to Aeolian vibration.

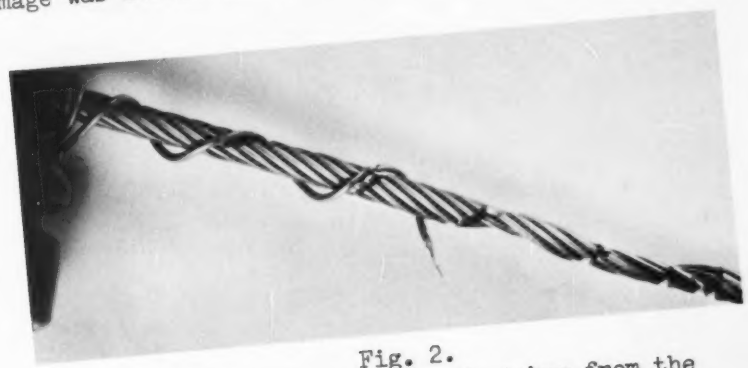
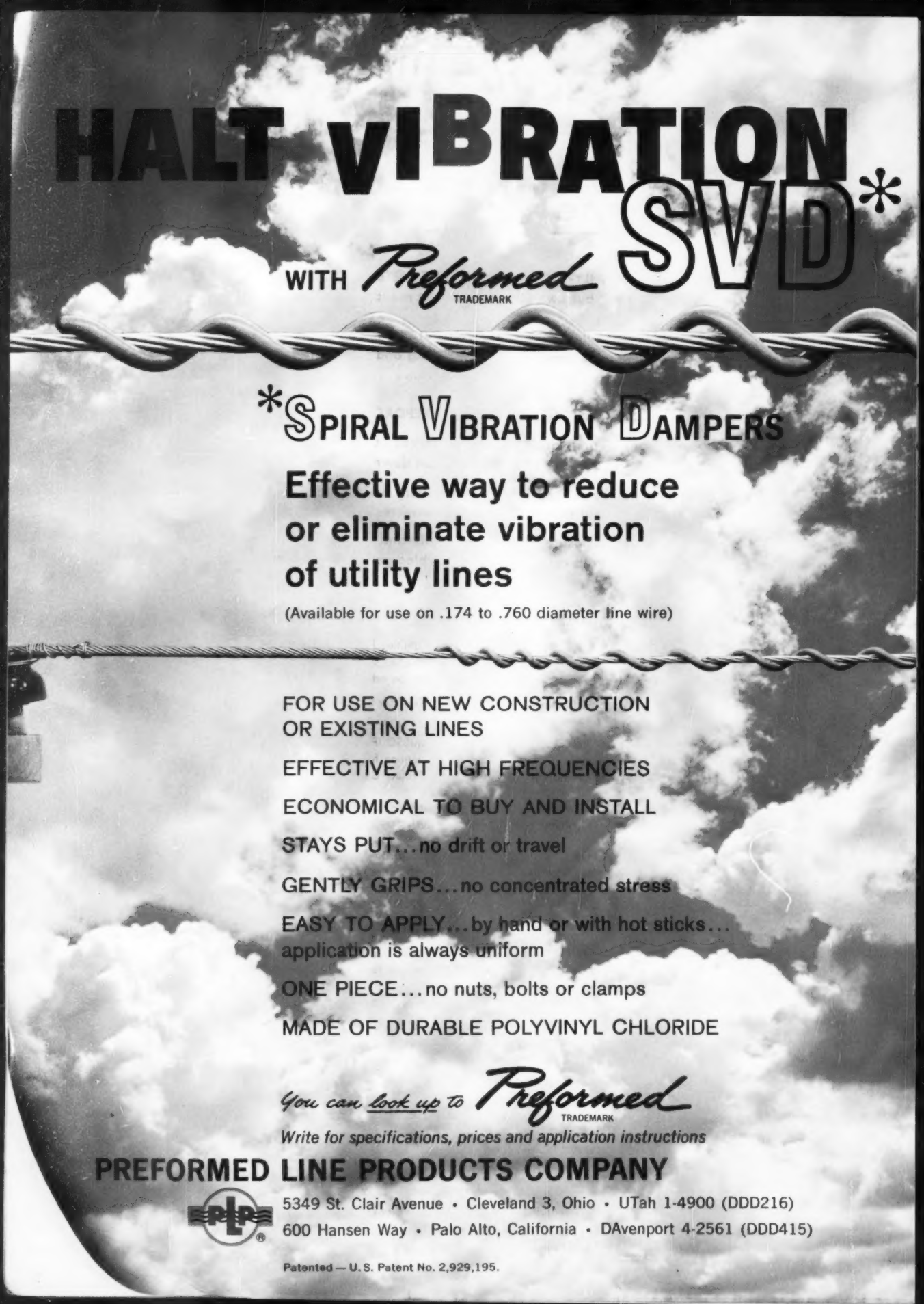


Fig. 2.

Deep gashes in the armor rod, taken from the same line, illustrates the excessive chafing damage resulting from Aeolian vibration on undamped lines in locations where wind, temperature, and terrain are conducive to sustained vibration. Without protective armor rods at the tie points, this damage would have occurred to the conductor.

See other side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The Electrical Week

LATE NEWS ▸ **Litigation on the state level** starts between Washington Public Power Supply System and Pacific Northwest Power Co over the legality of a state construction permit granted to WPPSS to build either Nez Perce or High Mountain Sheep dams. In Washington Superior Court, PNP asks that the order be declared null and void or remanded until hearings can be held. Earl Coe, director of the Department of Conservation, granted the permit without hearing PNP arguments against it. Meanwhile, briefs due December 15 from both organizations before the Federal Power Commission are now due January 15. WPPSS Attorney Evelyn Cooper suffered a mild heart attack and a delay was granted by FPC.

Brazil announces intent to build 60-Mw nuclear generating station in state of Rio Grande Do Sol. Nine firms have qualified for construction of 300-Mw plant announced earlier, and bids will be invited for this job by end of year.

Feasibility of further interconnections with intent to pool generating reserves will be studied by Cincinnati Gas & Electric Co, Columbus & Southern Ohio Electric Co, and Dayton Power & Light Co. Total generating capacity of the three is 2,837 Mw.

Under-channel 200-kv, 160-Mw, dc power link between England and France goes into commercial operation. Running from Lydd in Kent to Echinghen, near Boulogne, the line is underwater 34 miles and has a total length of nearly 40 miles. Story next week.

Strike threat against Consolidated Edison Co ends as union accepts new one-year contract. Pay increases of $4 and $5 a week are granted.

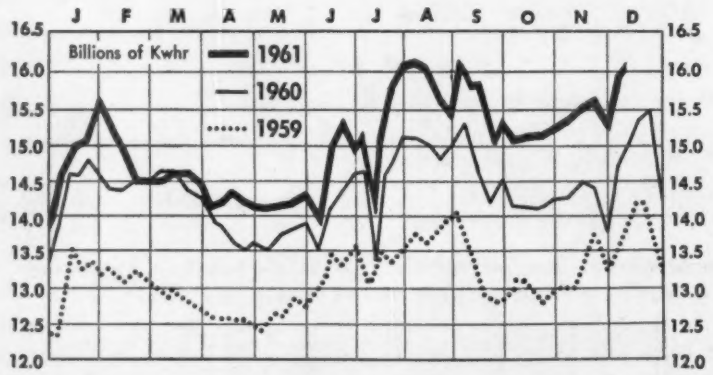
Orders for five gas turbines and the largest steam unit in Latin America are received from Argentina by International General Electric Co. The 194-Mw steam unit will go in a station at Puerto Nueve. The five packaged power plants will be placed in service in power-short outlying areas of Buenos Aires.

Fred Oldendorf is elected president of California Electric Power Co to succeed Carl C. Ernst who died of a heart attack in New York December 5. Oldendorf also becomes a member of the board of directors and its executive committee.

Outstanding Young Electrical Engineer of 1961, named by the Eta Kappa Nu Assn, is Clarence J. Baldwin Jr, 32, of the Westinghouse electric utility engineering department. Honorable mentions go to Wilbert L. Shevel Jr, 29, International Business Machines, and Howard A. Zollinger, 32, Westinghouse.

WEEKLY POWER OUTPUT—Up 7.1%

(Week ending Dec. 9), Kwhr 16,084,000,000



Percent Change From Previous Year

	Nov. 25	Dec. 2	Dec. 9
Total U. S.	+10.4	+ 8.0	+ 7.1
New Eng.	+12.0	+ 9.1	+ 8.7
Mid. Atlan.	+11.5	+ 9.7	+ 9.2
Cent. Indust.	+10.0	+ 8.0	+ 7.3
West Cent.	+11.9	+ 6.9	+ 7.9
Southeast	+ 9.1	+ 5.2	+ 4.6
South Cent.	+ 8.9	+10.2	+10.1
Rocky Mount.	+11.5	+ 9.4	+10.8
Pacific NW	+ 8.2	+ 5.7	+ 1.4
Pacific SW	+14.4	+12.1	+ 8.4

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Source: Edison Electric Institute

Supply Lines

PRESSURE STILL ON TO KILL RESIDUAL IMPORT CONTROLS

Coal suppliers are claiming no more than a temporary reprieve from efforts to kill import controls on residual fuel oil. President Kennedy has postponed any changes in oil import controls until mid-1962. Since the allocation period for residual oil runs to April 1, residual imports will be maintained at present levels until then. New allocations will probably be made on the present basis (permitting enough imports to fill the gap between domestic supply and over-all demand) to carry over from April 1 until a final decision is made on the controls.

Opposition to controls on residual oil is, if anything, growing stronger. (Supply Lines, Sept. 25). Coal interests are still asking for firmer barriers against Venezuelan residual. But they would feel vindicated if any form of control survives.

East Coast consumer interests are attacking the delay announced by Kennedy. For example, Sen Jacob Javits (R.-N. Y.) says there's no need for more study, and there's no justification for subjecting users to higher costs throughout the winter months. Javits and other foes of controls charge the curbs have raised residual prices.

Administration opponents of oil import controls have turned out to be more numerous and louder than expected. State, Commerce and Defense Department officials have questioned the need for controls. Administration advocates of a more liberal trade policy have asked how the restrictions jibe with their announced objectives.

There is speculation now that coal states might salvage some form of residual controls in the upcoming Congressional fight over trade policy. Industry spokesmen in Washington are wondering if Kennedy hasn't delayed a verdict on controls in order to hold them for use as a bargaining point when he is rounding up votes for his program of freer trade.

Even if coal succeeds in maintaining the controls, there's little likelihood they will be made tighter. As he makes a final decision, Kennedy will have the arguments of Venezuelans against controls fresh in mind. And if the Office of Emergency Planning, which is studying residual imports, follows the advice of the Defense, Commerce and State Departments, it will find it hard to recommend continuation of the controls, much less more restrictive ones.

WESTINGHOUSE 'BOARD OF ADVICE' BACKS CRESAP

Westinghouse Electric Corp President Mark W. Cresap has won a pat on the back from the four-man "Board of Advice" created to appraise the company's plans for assuring compliance with the antitrust laws. The "Board of Advice" met with the Westinghouse management for eight days last summer and fall and were presented case studies in pricing and marketing on large and medium turbines, meters, small motors, air conditioning, refrigerators and new products.

Some members of the Board (Erwin N. Griswold, Harvard Law School; Eugene V. Rostow, Yale Law School; S. Chesterfield Oppenheim, Michigan Law School; and A. D. H. Kaplan, Brookings Institute) have suggested to Westinghouse what the company's competitive posture ought to be. Cresap has said that when the views of the board become concrete, they "may suggest suitable subject matter for presentation to Westinghouse management groups . . . "

The objective would be to "focus the thinking of the Westinghouse organization beyond mere enforcement of compliance with the letter of the antitrust laws and toward . . . competition of a type which is consistent with vigorous and profitable growth as well as high standards of business conduct."

BUREAU STUDIES BIDS ON EXPERIMENTAL GLEN CANYON TOWERS

Bids on 32 experimental transmission towers on a seven-mile section of Bureau of Reclamation's 230-kv Glen Canyon-Shiprock line are being studied by the Bureau. The five bid schedules were (1) furnishing four guyed vee and four guyed H-frame galvanized steel structures with legs of box truss cross-section, and testing one of each type structures; (2) furnishing four guyed vee and four guyed H-frame galvanized steel structures with legs of tubular cross-section, and testing one of each type; (3) furnishing four guyed vee and four guyed H-frame aluminum structures with legs of box truss cross-section; (4) furnishing four self-supporting aluminum structures (horizontal conductor configuration), and testing one structure; (5) furnishing four self-supporting aluminum structures (triangular conductor configuration) and testing one structure.

Bidders under schedule (1) were Anchor Metals, Hurst, Texas, $24,796; and American Bridge Div., US Steel, $40,416. Only schedule (2) bidder was American Bridge at $49,400. Schedule (3) bidders were Reynolds Metals, $21,637; Michael Flynn Mfg Co, Philadelphia, $28,810; Aluminum Co of America, $37,023; Harvey Aluminum, Torrance, Calif., $41,000. Schedule (4) bidders were Reynolds Metals, $16,434; and Aluminum Co of America, $23,399. Schedule (5) bidders were Reynolds Metals, $19,316; and Aluminum Co of America, $24,728. Combination bidders on schedules (3), (4) and (5) were Reynolds Metals, $57,102; and Aluminum Co of America, $79,151.

CORDINER: TARIFFS NOT BEST SOLUTION TO TRADE PROBLEMS

General Electric Co Chairman Ralph Cordiner told a press conference that GE does not think that protective tariffs are the best solution to the problems of international trade. But if the United States reduces its tariff protection, other nations must also reduce their trade barriers on the same commodities "so that the Atlantic Community can in fact move toward the eventual development of a great common market."

"Of course," he added, "we do not yet know what specific proposals the government will make with respect to trade policy, but the point is that any proposal which would make it easier for foreign concerns to sell their goods in the United States must also be accompanied by government policies that will make it possible for industry here in the United States to meet that competition in this country and abroad."

LOS ANGELES WANTS FUEL CONTRACTS UP TO 20 YEARS

Bids for gas and oil supplies to operate its generating plants for as long as the next 20 years have been called for by the Los Angeles Dept of Water & Power. Expenditures of possibly more than a half billion dollars are involved. Natural gas for use at four DW&P steam plants represents the major fuel requirement.

We'll show you proof of savings!

Conductor side-sway is an important factor in the design of high-voltage transmission lines.

On a conventional 230-kv line with free-swinging suspension strings, conductor sway at the structure necessitates an additional 35 feet of width in the right of way, an additional 10 feet of crossarm width, and an additional 10 feet of structure height. These requirements are correspondingly higher at higher voltages.

If conductors are restrained by V-strings, significant savings can be achieved in right of way, structures, and maintenance - - and electrical performance of the line can also be improved.

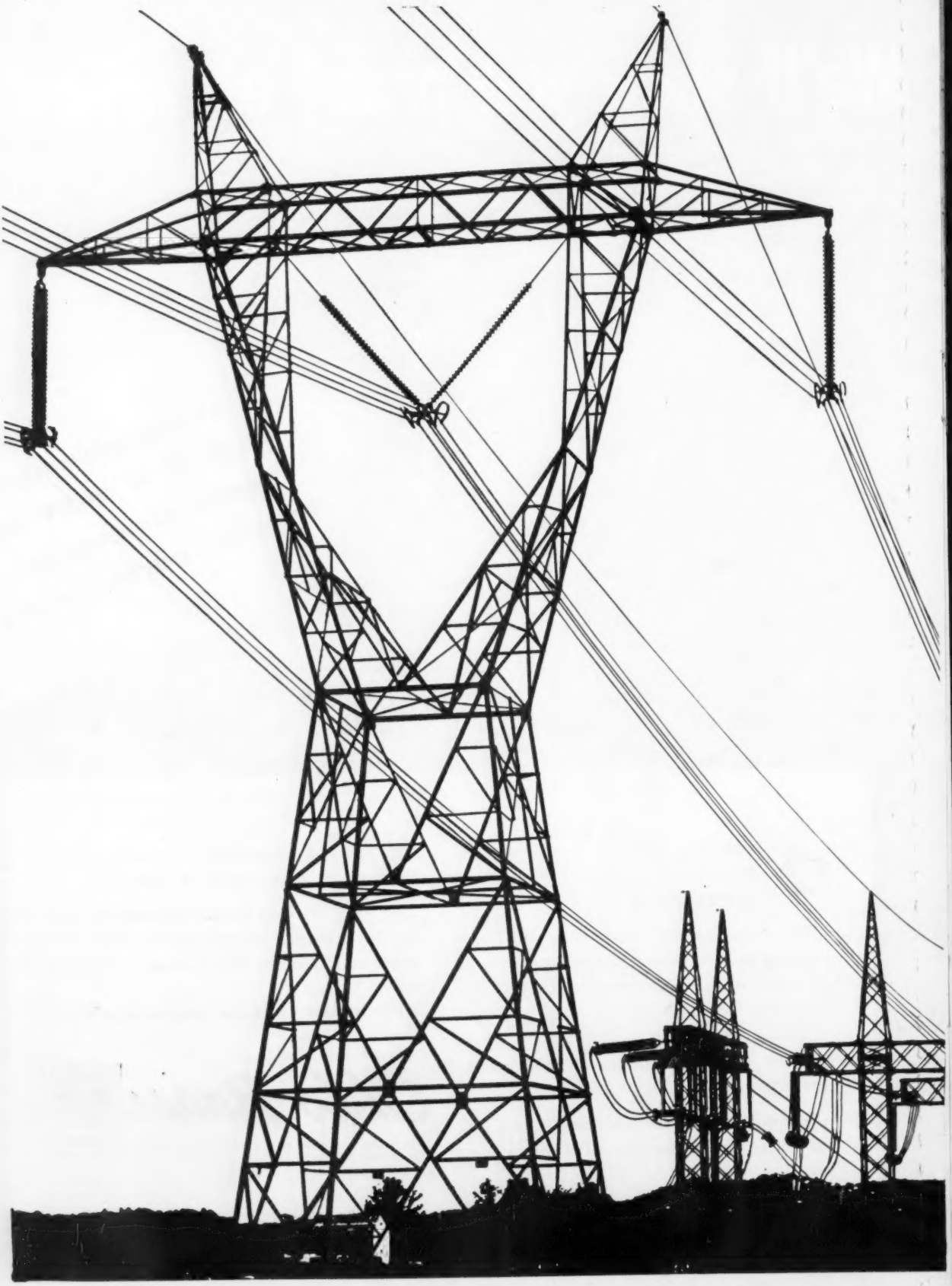
If you'd like more detailed information, send for O-B publication number 1503-H, "High Voltage Line Economies With V-string Insulators."

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10094-H



This mark tells you a product is made of modern, dependable Steel.

Project:	Apple Grove
Subject:	750,000 volts
Sponsors:	Westinghouse Electric Corporation American Electric Power Service Corporation
Tower Design:	American Bridge
Tower Fabricator:	American Bridge
Substation Fabricator:	American Bridge
Deadend Frames:	American Bridge

American Bridge Division of United States Steel

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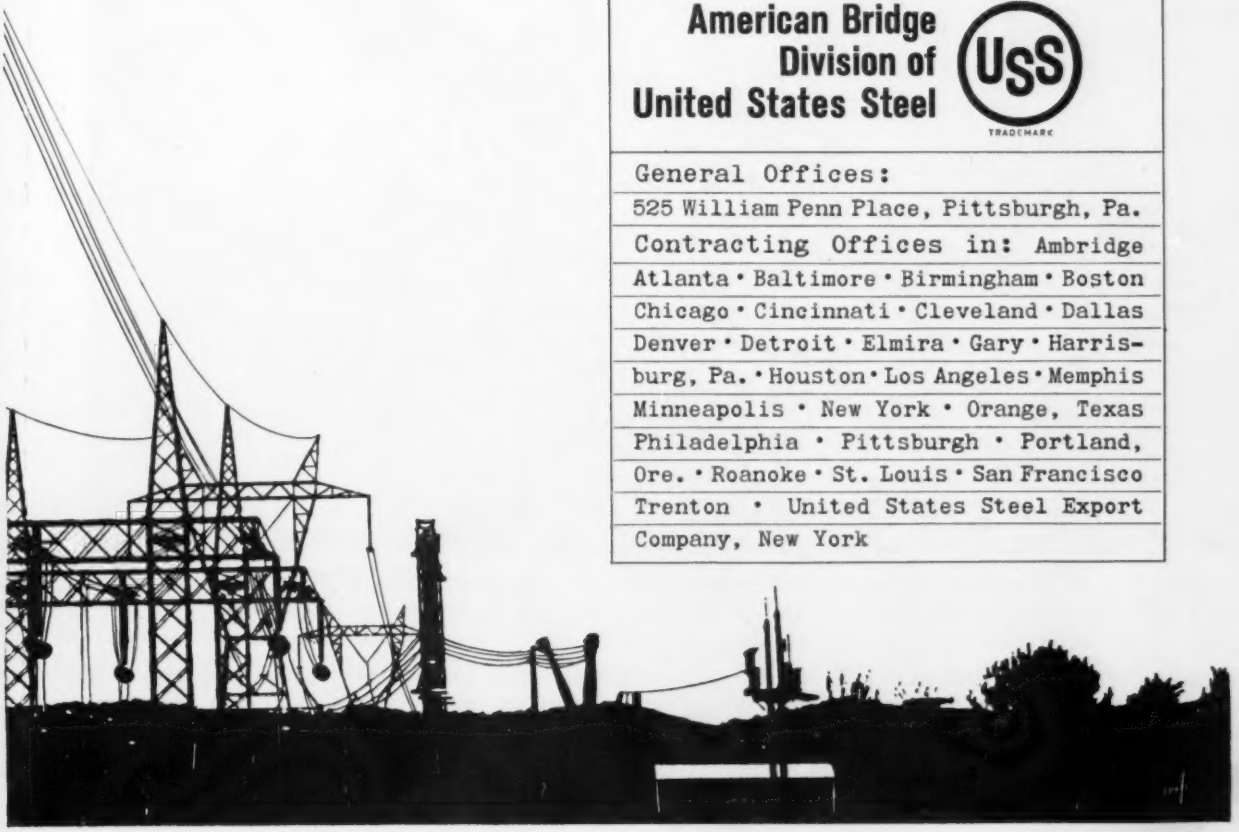

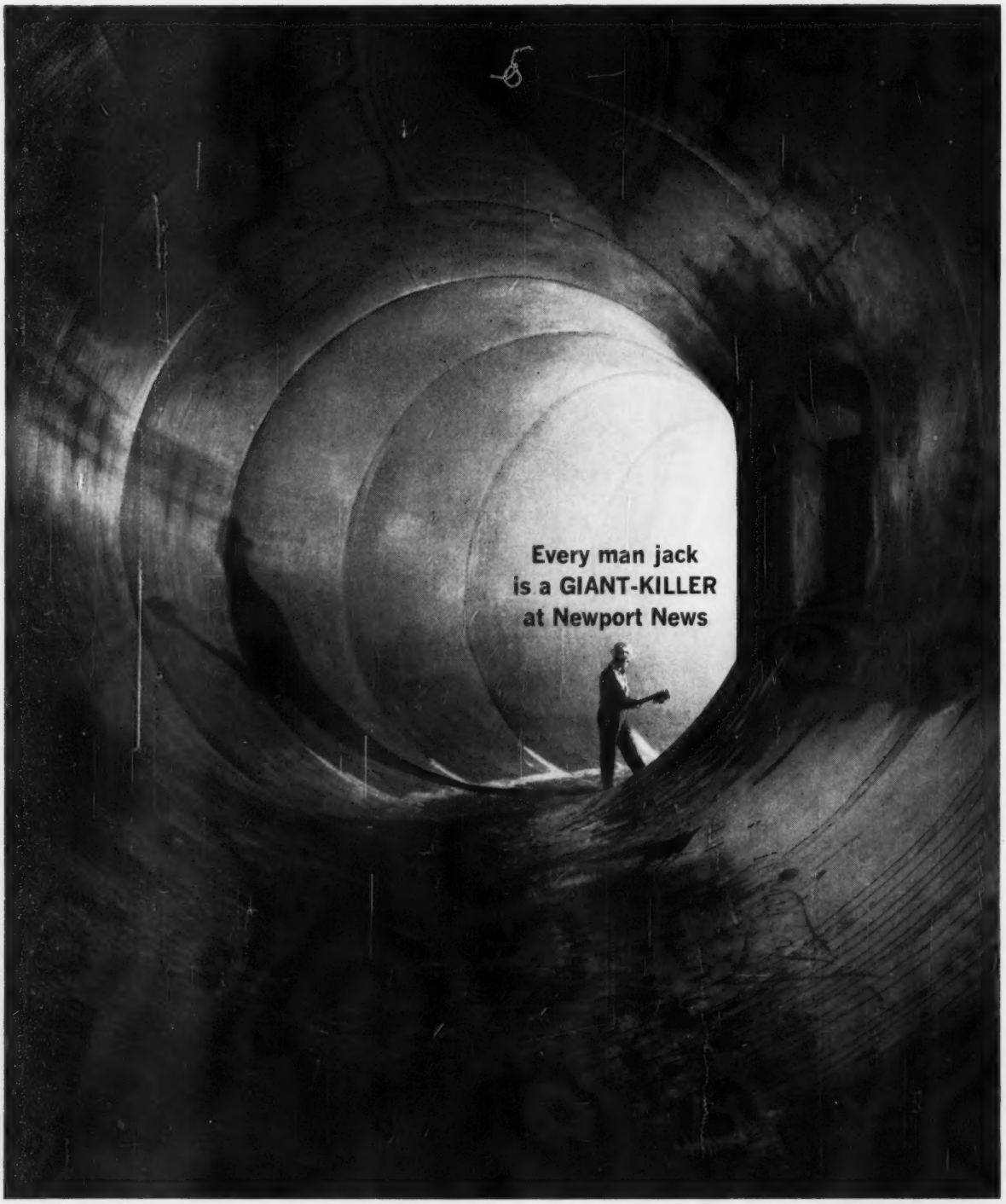

This huge hydraulic turbine casing dwarfs the workman—but to him and 15,000 others at Newport News, tremendous jobs such as this are routine.

Here giant engineering and production challenges are conquered in stride. Turbines, valves, gates and penstocks for the greatest hydroelectric projects—Niagara, Grand Coulee, Hoover and 96 others. Pressure vessels and similar heavy equipment for the petrochemical industry. Paper dryer rolls, wind tunnels, bridge caissons—almost any job that calls for heavy steel fabrication and machining of massive parts to close tolerances.

Whatever your project, call on Newport News. It has the men, methods and machines to accept the toughest challenge.

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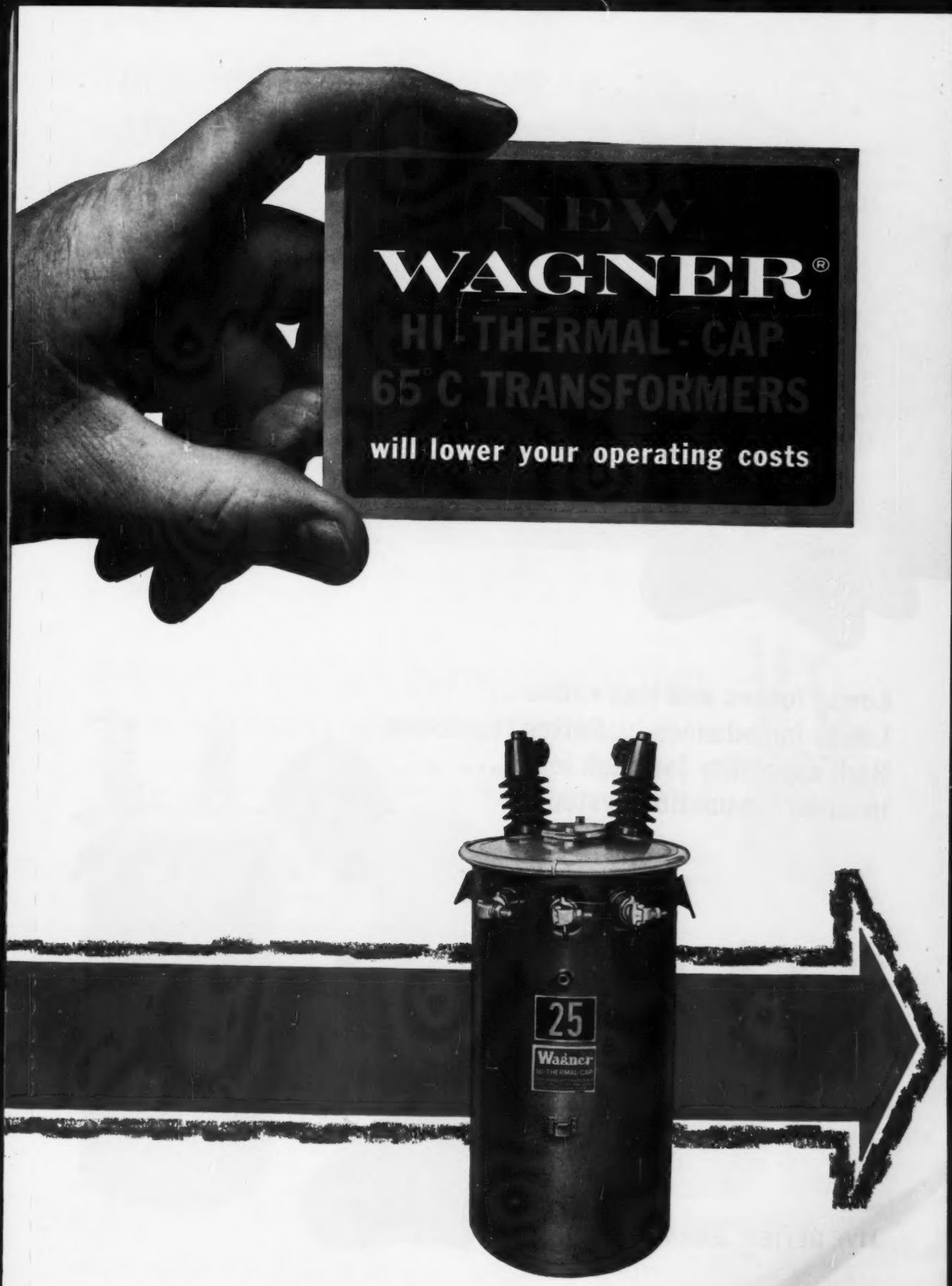

NEW
WAGNER®
HI-THERMAL-CAP
65°C TRANSFORMERS
will lower your operating costs
25
Wagner
HI-THERMAL-CAP

Lower losses and loss ratios...
Lower impedances... Better regulation...
High capability for peak loads...
Insuldur® insulation systems

LIVE BETTER...*Electrically*

THEY OPERATE WITH LOW LOSSES

L_2FPL means lower losses for peak loads

This also means more economical operation at all loads. Core losses are low, copper losses have been reduced, resulting in lower total losses and lower ratios of approximately 2.5 to 1. This provides savings in cost of losses under normal loading conditions, and on overloads. Since the cost of losses greatly affects operating expense, the lower total losses add up to lower operating costs.

These new Wagner® Transformers will help you meet tomorrow's loads and their requirements reliably and economically.

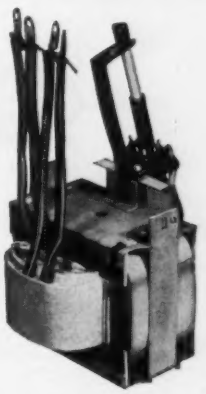
HANDLE PEAK LOADS WITH EASE

INSULDUR® Insulation System allows high thermal loading with 65°C rise transformers

The high thermal capabilities of Wagner HI-THERMAL-CAP 65°C Transformers result from the use of Insuldur layer insulation and high temperature epoxy coated conductors. The remarkable thermal-aging characteristics of Insuldur cuts insulation failure due to heat in half. Insulation retains full dielectric strength and binding qualities at 65°C operation.

MAINTAIN GOOD CUSTOMER VOLTAGE

Lower impedances improve voltage regulation



Impedances for ratings 100 Kva and below are 2% or less. You get minimum voltage drops even under high overloads—regulation problems are minimized.

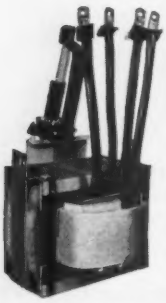
Coils are wound with thermosetting resin on the layer insulation which bonds the coils together. The new endplate design gives positive bracing. This assures high short circuit strength of at least 40 times full-load current.

ARE SMALLER AND LIGHTER

Allow you to increase capacity without additional investment in new poles

The new Wagner HI-THERMAL-CAP 65°C, 25 Kva, 7200 volt Transformers are lighter and smaller—2½" shorter than their 55°C counterparts, yet use approximately the same amount of oil. They are easier to store and handle —take less space on poles. For example, a 55° 100 Kva transformer can be replaced with a 65° 167 Kva transformer.

WITH ALL THE FEATURES YOU WANT



SIMPLIFIED ENDPLATE DESIGN

The new endplate assembly provides rigid construction for greater mechanical strength. Virtually all nuts, bolts, screws, individual coil clamp blocks, springs, thimbles, angle irons and brackets are eliminated. The assembly is smaller in size—lighter in weight.

PLASTIC-COATED COVER

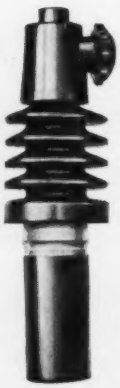
A porcelain-like coating gives improved corrosion resistance to covers, protects from line to ground, insulates small animals from the grounded cover to prevent outages. Coating is applied to covers, to the Shur-Seal clamping ring, and to cover bolts.

NEW LV BUSHING ASSEMBLY

The re-designed LV bushings for transformers through 167 Kva provide better gasketing. Terminals are larger to accommodate aluminum conductor. Special lock washers provide better clamping for conductors.

HV BUSHING DESIGNED FOR SAFE INSTALLATION

Heavy wet-process porcelain HV bushings, with undercut petticoats, have insulated knob for hand tightening of terminals. All 2400 v and 4800 v transformers have HV bushings arranged to facilitate application of arresters.



Plus... **HIGH TEMPERATURE INSULATING OIL — LONG-LASTING SURE-SEAL PAINT — ROLLED UNDER BASE DESIGN**

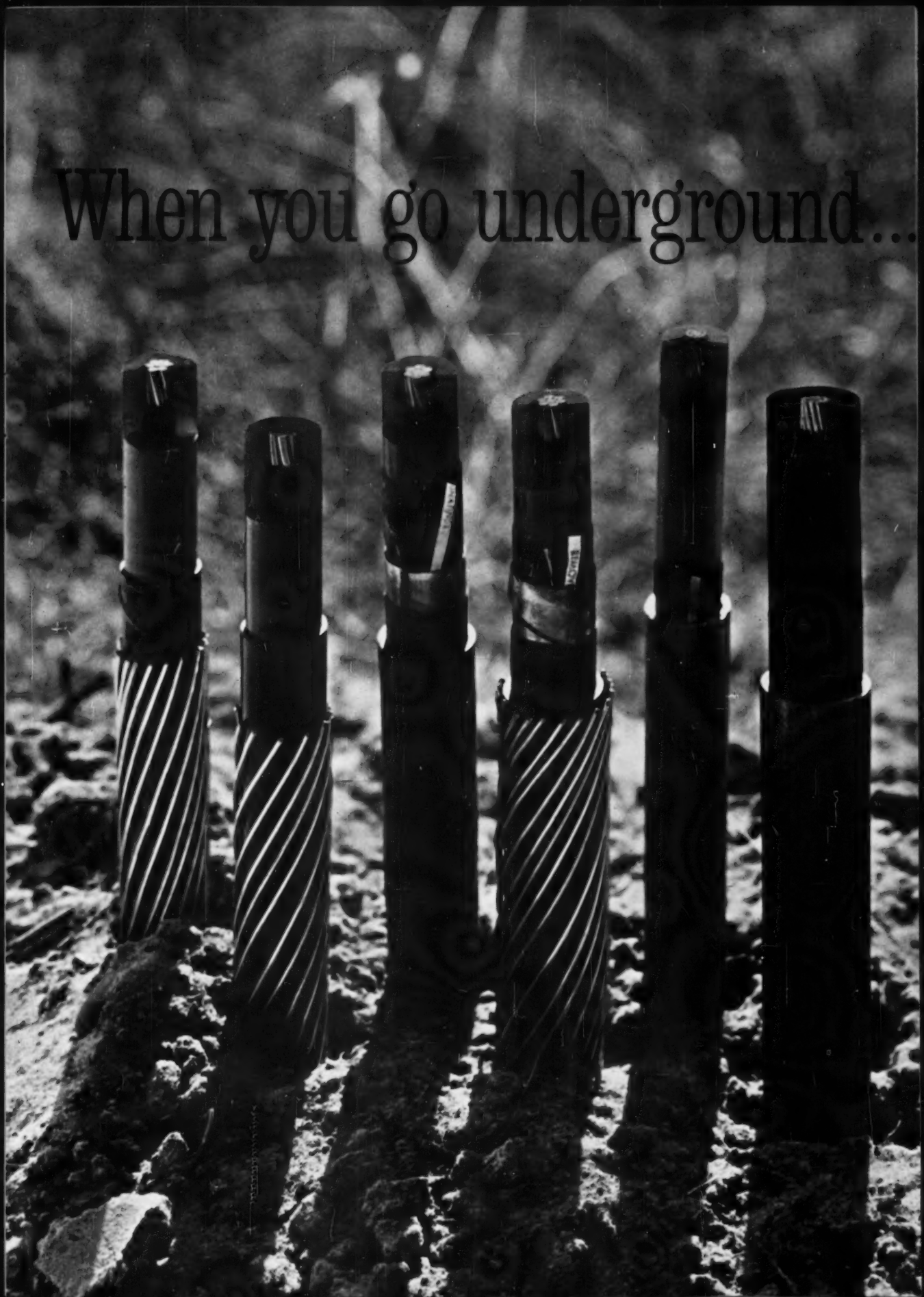
For additional information on this new dollar-saving line of Wagner® HI-THERMAL-CAP 65° C Transformers, ask your near-by Wagner Sales Engineer, or write us.

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MO., U.S.A.

Manufacturers of LOCKHEED® Products

WT61-18


When you go underground...

...go with those who know

Rome Cable Division of Alcoa announces a new service for utilities

Whether or not underground becomes *the* distribution system of the future is in your hands.

But the day you decide that you're going underground, Rome is ready.

Ready with cable for duct or direct burial. Ready not only with a full line of primary and secondary cables, but also with knowledge and experience in types of systems, installation, maintenance and trouble-shooting.

Cables, of course, are our basic interest, because that's what we know the most about. And it's what our engineering skills and facilities are devoted to . . . exclusively.

Since the cables we've designed and built for underground cover the full range, you can be sure that any recommendation will be based on your needs rather than merely on what's available.

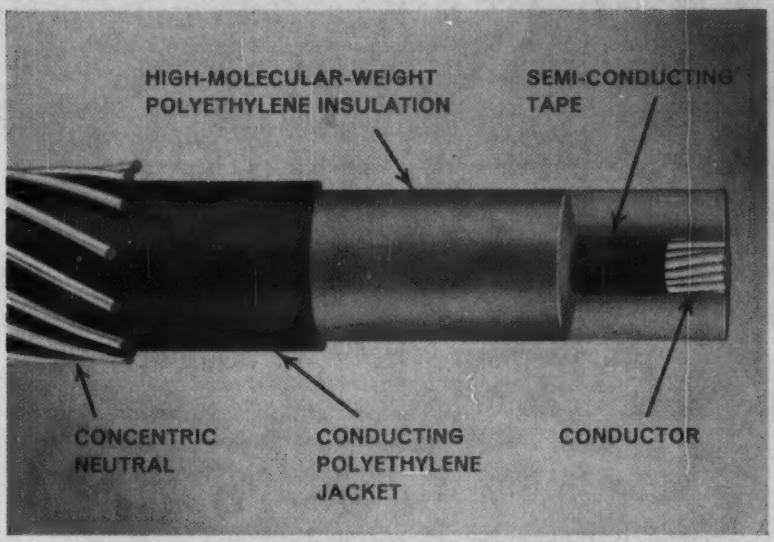
So we issue this invitation: Come to Rome when you're ready to go underground. We're ready now—with the cable you need as well as with people who can give you expert counsel.

And, starting with this issue of this publication, we will publish a monthly sheet covering various aspects of Underground Residential Distribution. Look for the big URD designation. Another service to utilities from Rome Cable Division of Alcoa, Rome, New York.

URD

UNDERGROUND RESIDENTIAL DISTRIBUTION

What to look for in primary cable



Typical of the Rome primary cables for underground use is this 15 KV design available with copper or aluminum conductor, high-molecular-weight polyethylene insulation, conducting polyethylene jacket and a concentric serve of tinned copper wires. Concentrically served neutral also provides increased safety and protection.

Let's start with *insulation*. When you come to Rome for your cable, you have a choice. You can select from oil-base rubber like Rome Rozone, butyl-base rubber, or polyethylene.

All are well suited to underground systems, since they offer a high degree of ozone resistance, exceptional moisture resistance, and excellent dielectric stability.

From a cost standpoint, polyethylene offers many advantages. Since it was introduced in 1940, it has had a long history of successful operation in radar and communication circuits as well as in power, control, and submarine-telephone cable. Polyethylene is ideally suited to high voltage applications, its use for ratings through 15 KV being well documented in IPCEA specifications.

How about *shielding?* IPCEA recommends it for single-conductor cables above 3 KV, either for direct burial or underground ducts. We provide shielding through metallic tape, lead sheath which can also serve as all or part of the neutral return, or concentric wrap of tinned copper wires, all in conjunction with semi-conducting tapes or jackets. (Note: Such a concentric provides not only shielding, but also neutral capacity and safety for personnel in event of "dig-in.")

Rome offers, as standard, many different primary cable types. All are rated at 5 KV or 15 KV, with grounded neutral. Chances are good that from this array you can match your needs. If not, we'll work with you on design and production of just the right cable.

We're ready to go underground any time you are—with the right cables to do the job. We'd be happy to provide specs and discuss details. Call the local Rome-Alcoa sales office for more information. Or write to the address indicated.

Reliability of underground among its many advantages

There can be no question that underground systems add to the attractiveness of residential areas.

In addition, properly designed systems also offer many advantages to the utility. Reliability of service is one of these and an important one in view of the trend toward the all-(or almost all-) electric home.

Past performance indicates that reliability of service—as measured in cable failure rates—is better with underground than overhead systems.

The fact that underground systems are less susceptible to damage from storms means not only reliability, but also lower maintenance costs in many cases.

OFFER: Some of the material summarized here has been taken from our just-published manual on Underground Residential Distribution Systems. In its fact-filled pages you will find much useful information, including complete data on Rome products. A note on your letterhead will bring you a copy. Write to: Rome Cable Division of Alcoa, Dept. 2-121, Rome, New York.

ALCOA
ROME CABLE
DIVISION

Merry Christmas

To all our 1961 customers, including the cities of Los Angeles; Fort Pierce, Florida; and Troy, Ohio, for turbine generators ☞ American Electric Power for communications equipment ☞ Outboard Marine Corp. and The Budd Company for electric furnaces ☞ Arizona Public Service for transformers ☞ Alabama Electric Cooperative for airblast circuit breakers ☞ and the many other U.S. companies, large and small, with whom we are pleased to do business.

To the scores of U.S. suppliers from whom we bought materials and equipment this year.

To the men and women in our affiliated sales and service organizations throughout the U.S.

To our 73,000 co-workers in Brown Boveri's 40 plants and in our sales and engineering offices in over 80 countries of the Free World.

To G.E., Westinghouse, Allis-Chalmers and our other competitors for adding zest to our efforts.

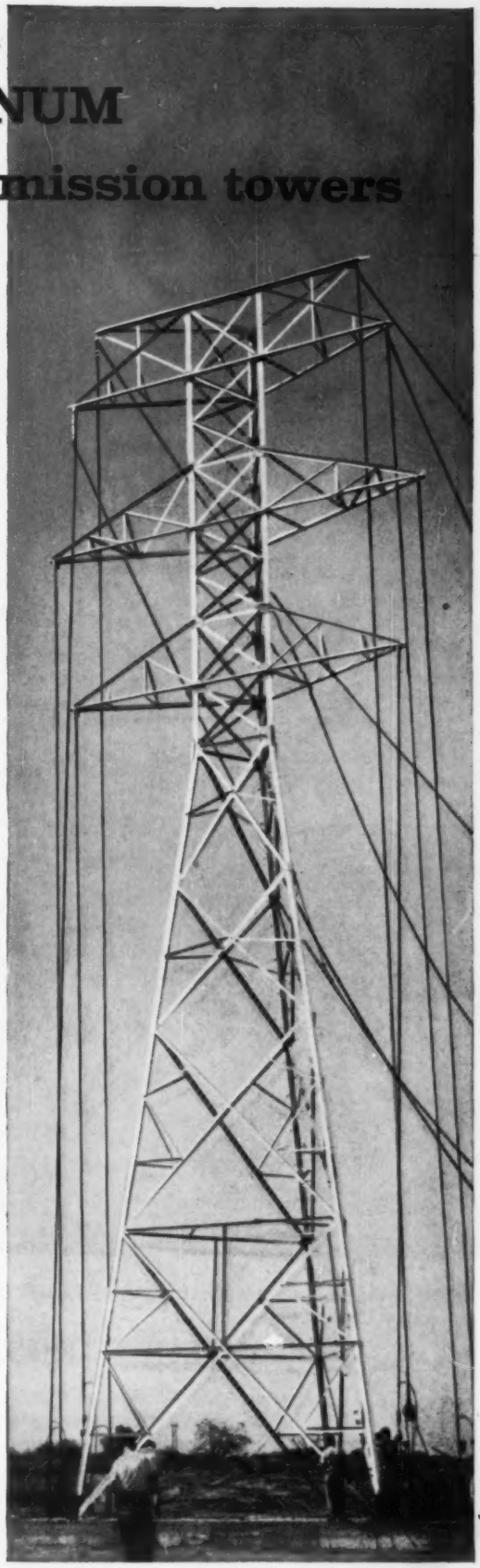
from Brown Boveri

Full-line manufacturer of electrical and mechanical power equipment for industry and utilities. Brown Boveri Corporation, 19 Rector Street, New York 6, New York

REYNOLDS ALUMINUM

"custom tailors" transmission towers

to cut your costs



At Phoenix, Arizona, Reynolds Structural Fabricating Division is designing, fabricating and assembling new aluminum towers. Because aluminum is light in weight, fabrication and assembly are simplified. Because aluminum combines strength with light weight, structure weight can be reduced 60 to 70% while retaining load-carrying capacities of structures made of heavier metals. And these lighter weight structures naturally cost less to ship, cost less to erect. (Helicopters can even be used to transport lightweight aluminum structures into otherwise inaccessible areas.)

Towers built of aluminum require only minimum maintenance because aluminum is corrosion resistant and cannot rust, ever. It is an ideal material for structures located in seacoast areas or industrial atmospheres. In contrast to aluminum, periodic protective painting on towers made of other metals can very easily, over a period of years, cost more than the original tower! Also with aluminum, there's no problem of painting "hot" towers or the costly practice of stopping transmission service for maintenance.

Reynolds can offer a complete series of standard aluminum structural shapes or design new shapes to fit your requirements. New types of transmission towers are constantly being designed, fabricated and tested at Reynolds Structural Fabricating Division in Phoenix.

Add up aluminum's advantages in fabrication, assembly, erection and maintenance. The result: transmission towers that will deliver longer service at a lower per year cost. For complete information, call your nearest Reynolds Sales Office or write *Reynolds Metals Company, P. O. Box 2346-EL, Richmond 18, Virginia.*

Watch Reynolds exciting TV programs on NBC: The Dick Powell **Reynolds Aluminum Show** every other Tuesday; **Say When,** weekdays; **All Star Golf**— in living color—every Saturday.

With IBM 7070-1401 Data Processing System...

Connecticut Light & Power

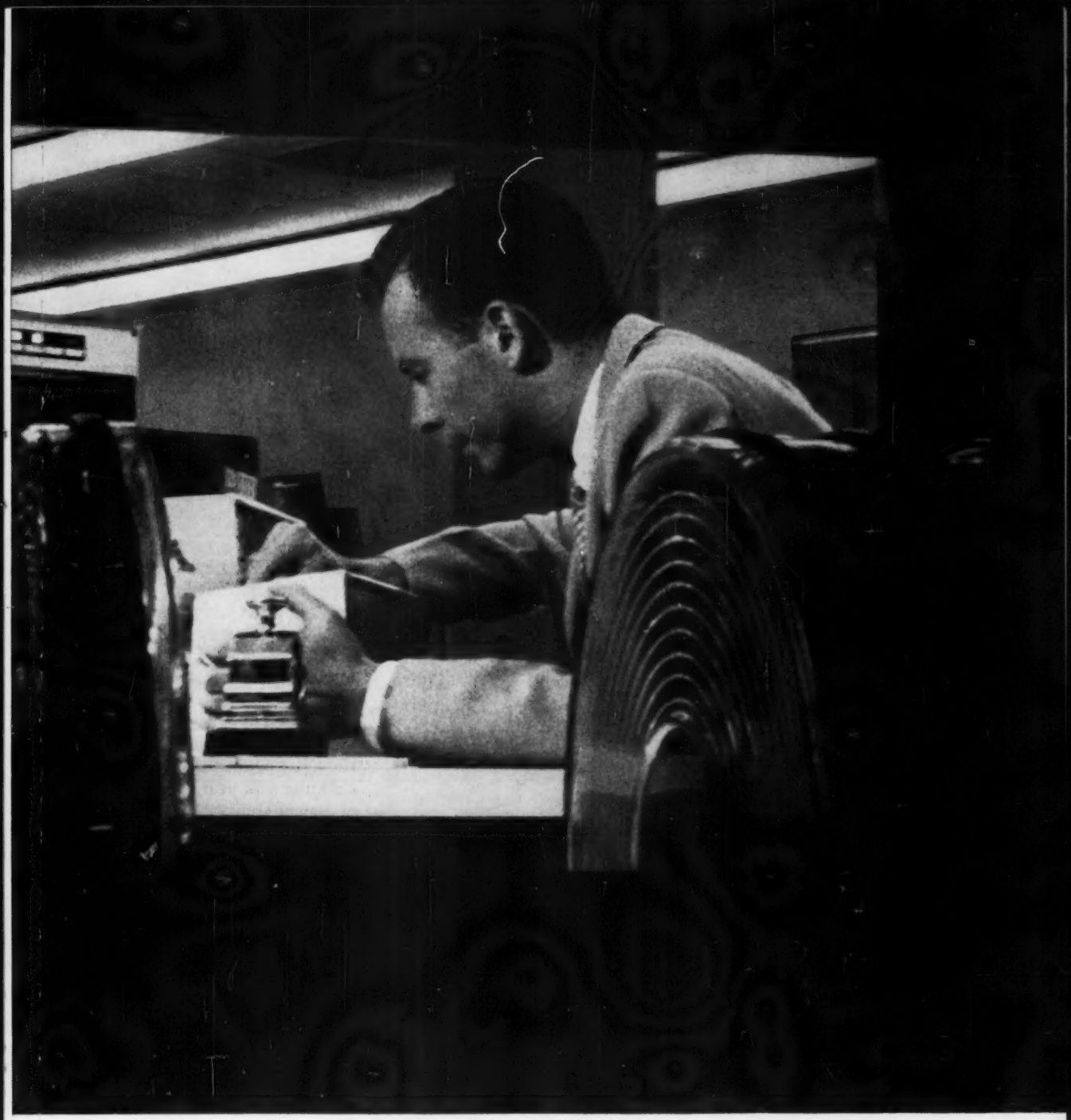
Complete customer accounting on a daily basis is now a practical, profitable reality at Connecticut Light & Power.

Each day, an IBM 7070-1401 System processes all accounts of the company's more than 430,000 electric and gas customers. The system accepts data concerning collections, overdue accounts, new meters, etc., then posts all affected accounts.

Result: Connecticut Light & Power now balances its books daily, prepares general ledger entries in an hour each month.

Among the many advantages of this IBM 7070-1401 System:

• Completely automatic billing and accounting—starting with mark-sense, meter reading cards and going to month-end general ledger.



updates every account...every day

- Daily account register created as a by-product of daily activity.
- Up-to-date statistics available to management on demand.
- Credit and past due follow-ups signalled automatically.

Connecticut Light & Power also uses its IBM 7070-1401 System to handle complete installment accounting for its appliance sales. In addition, the company is planning to put the same system to work on a variety of engineering and research studies, forecasting, budget, and general accounting.

You'll find there's an IBM Data Processing System to meet *your* needs. The Utilities Specialist at your local IBM office will be glad to give you complete details.

IBM®
DATA PROCESSING

CONTROL CABLE

This new Breed Plant has the generating capacity of half-a-million kilowatts. That's 670,000 horsepower in mechanical energy. PARANITE PVC CONTROL CABLE was ordered to harness this great abundance of energy. It's yet another case history of the nationwide acceptance of Paranite's 72 year record of dependability.

FROM POWER STATION TO CONSUMER

Paranite manufactures a FULL LINE of proven quality wire and cable products. From 600V to 28,000V power cable right down to service entrance and non-metallic sheathed cables you know "*If it's Paranite, it's right.*" All popular sizes of power cable can be ordered directly from stock. Special constructions to meet your exact requirements.

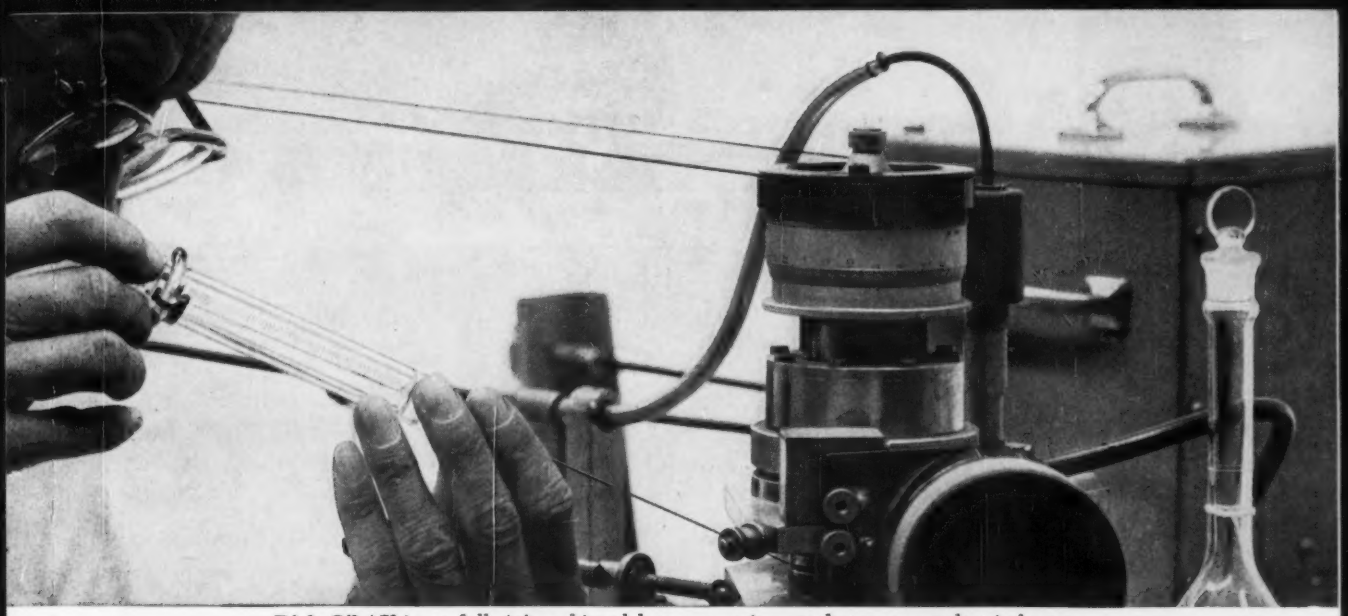
SINCE 1890

PARANITE WIRE & CABLE DIVISION

Essex Wire Corporation, Marion, Indiana

MANUFACTURING PLANTS: Marion, Indiana; Jonesboro, Indiana; Tiffin, Ohio

Sales Offices and Redistribution Warehouses in all Principal Cities.



Diala Oil AX is carefully injected into laboratory equipment that measures electrical properties of the oil. This is one of the ways Shell makes sure that dielectric strength is high.

BULLETIN:

Shell reveals how Diala Oil AX lasts up to 5 times longer than ordinary oils

Only an oxidation-inhibited transformer oil of exceptional quality can be expected to give long service life under today's severe operating conditions.

That's why a growing number of utilities are switching to Shell Diala Oil AX. Read how Diala® AX helps them hold costs down—and how it can do the same for you.

THE DISTRIBUTION transformer is of constant concern to most utilities. It often operates outside its rated capacity during peak periods. Temperatures run high. And transformer maintenance costs are on the rise.

All of these factors have prompted utilities to search for a stable transformer oil that can help protect overloaded equipment, extend transformer life and reduce maintenance.

The answer for many utilities: Shell Diala Oil AX.

What Diala does

Diala AX contains a special Shell-developed oxidation inhibitor.

Accelerated laboratory oxidation tests show that Diala AX can provide satisfactory service *up to five times as long as* uninhibited oils.

Because of the oxidation inhibitor in Diala AX—and also because of Shell's selected base stocks and refining techniques—this remarkable transformer oil is exceptionally stable. It resists sludge formation. It helps prevent the creation of metal-attacking acids. And it reduces peroxide build-up which can damage many types of insulating materials.

Diala AX has also demonstrated an ability to extend the life of fabric insulation materials. In Shell's Emeryville, California laboratory, scientists soaked cotton insulating threads in many different oxidized oils—and for varying periods.

Conventional oils, when oxidized, weakened the thread by 25 to 40%. When subjected to the same oxidizing treatment, Diala AX had negligible effect on the thread's strength.

Diala AX has excellent dielectric properties (see photo above), good heat transfer characteristics and a very low pour point. Its low volatility reduces evaporation loss. And its flash point is high for maximum safety.

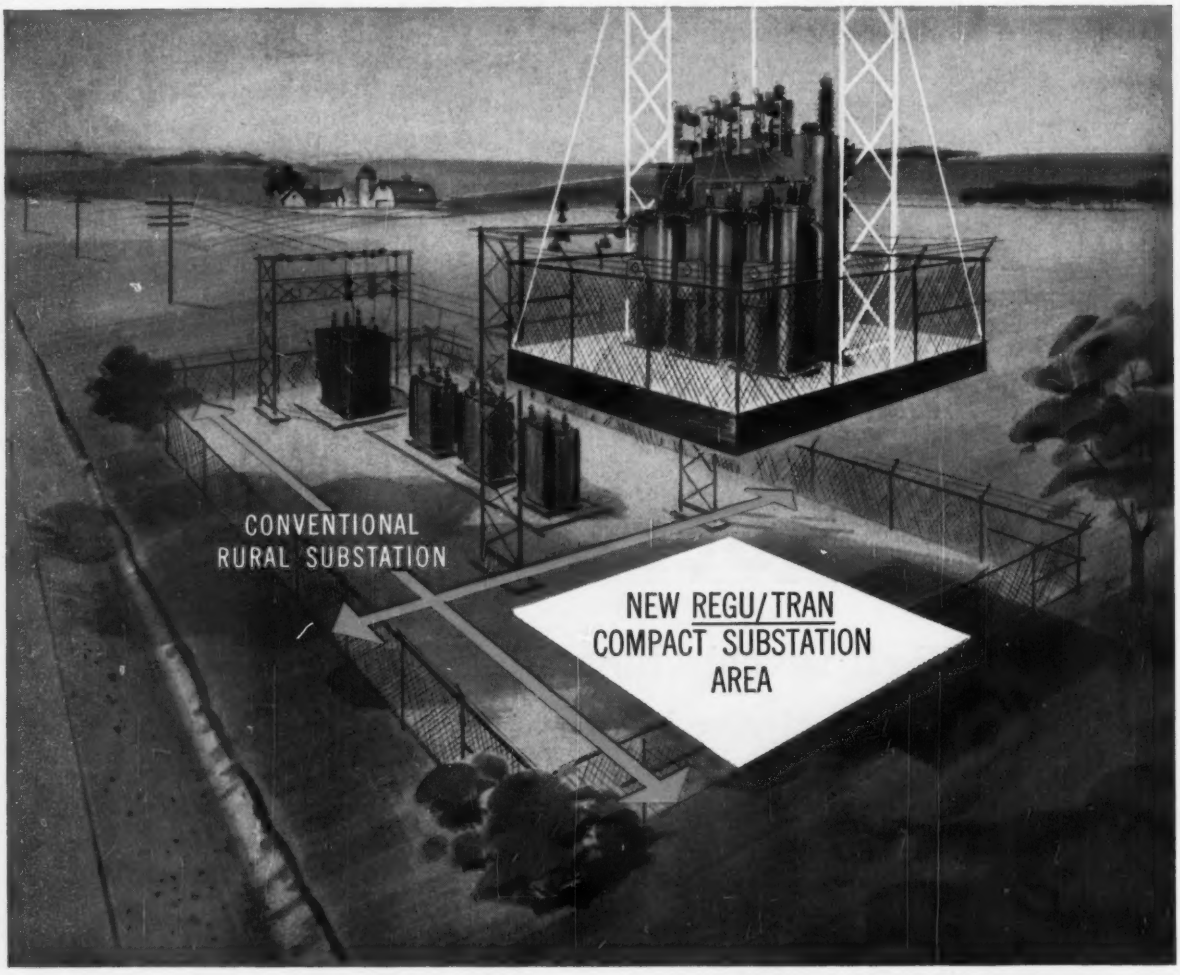
Call your Shell Representative

Ask your Shell Industrial Products Representative for all the facts on Diala AX. Or write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y.

SHELL

A BULLETIN FROM SHELL
— where 1,997 scientists are working to provide better products for industry

ALLIS-CHALMERS



Space – just one of many savings!

A complete, compact substation package from Allis-Chalmers!

You get guaranteed performance and the economy of a standardized item. *Regu/Tran* compact substation requires only 25% of the area needed by conventional rural substations.

More savings! Buy the entire package on just one purchase order. Shipments are dovetailed to your construction schedule. All parts are keyed to master drawings.

Designed for future load growth! All structural members are punched for adding H.V. and L.V. bays later.

Heart of the substation is the *Regu/Tran* unit. This new concept provides single-phase regulation with provision for safe by-passing of regulating equipment without dropping the load. A-1442

Regu/Tran is an Allis-Chalmers trademark.

Regu/Tran compact substation vs conventional

1. Just 1 mounting pad instead of 3	**2.** 4 piers instead of 6	**3.** 13'9" x 22' compared to 24'x62'
4. Requires just 25% of the real estate formerly needed	**5.** Cuts fencing needs in half	**6.** Requires considerably less grounding material
7. Less interior gravel or rock surfacing	**8.** Preassembled main structures cut erection time	**9.** Regu/Tran unit can be replaced with larger unit later without changing structure

Ask your nearby A-C office for Bulletin 61B9756 or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

Editorial Comment

DECEMBER 18, 1961

Lawyers Not Guilty on Two Counts

Lawyers today are being charged with two counts:

- They are impairing ethical and necessary communications among electrical equipment manufacturers.
- By their over-aggressive actions, they are creating an atmosphere of rancor between the manufacturers and the electrical utilities.

We wonder, however, whether the charges are well-founded.

It is not surprising that there should be extreme caution pervading today's relationships among suppliers. Although the antitrust criminal cases are completed, the civil decrees definitely are not finally determined. Further, outcome of the damage suits by the utilities against the manufacturers is still in the balance.

It is also true that the lawyers are heavily relied upon to interpret the existing, most complex situation. Thus it follows that they are the source of the extreme cautionary atmosphere which pervades the whole marketplace.

But lawyers, by nature, training, inclination and sometimes bitter experience, are likely to paint the very darkest picture possible of any potentially risky situation. Still, they are not always in the best position of assaying probabilities. Their field is possibilities. It is up to someone else to balance their expert counsel against a wealth of other information and to come up with policy.

By definition, legal counsel is, or should be, precisely that. Its job, out of court, is to *counsel* management on the legal implications of policy. Management must—or should—make the final decision.

To the extent that communications indeed are not what they might and should be, even considering the circumstances, it must not be assumed that legal counsel can be held responsible. For policy is management's prerogative. And it is policy which establishes the level of caution.

On the second count, that lawyers are causing embitterment between buyers and sellers, we must first establish whether indeed the alleged embitterment actually exists.

Counsel retained by the utilities is in the process of preparing damage cases, going through the legal motions necessary to pursue the protective courses adopted by almost every power supplier.

These motions are not exactly friendly in aspect. Most are prescribed by custom and procedure. They cannot be presumed to have trappings of cordiality. Counsel employing them are only doing their job.

Perhaps it is natural that those in the process of being sued should interpret the external appearance of these maneuvers as fairly representative of the attitude of the plaintiffs themselves.

But such, generally speaking, is not the case. Our contacts with a wide range of utility executives have indicated little deeply-imbedded embitterment toward the electrical manufacturing industry as a whole. There are, of course, exceptions, but the exceptions are few.

It would be unfortunate indeed if the pending court actions, and particularly their procedural atmosphere, are allowed to engender the feeling of distrust which some allege, to the extent that will actually cause it to exist.

Meanwhile, for lack of evidence, we must dismiss both charges against the lawyers.

Status of NEAR Program Still Cloudy

- **Government starting system evaluation studies to determine how many signal generators will be required**

- **Utilities still have no official proposals to work from as problems of establishing system are considered**

A spot check of electric utilities across the country last week revealed that few, if any, have a very clear conception of what form the National Emergency Alarm Repeater (NEAR) system will finally take. This was true at the same time the Office of Civil Defense was preparing to let contracts for evaluation of electric systems in Georgia, Wisconsin, and California, to see how many signal generators would be needed, and where they would be located.

Electric utilities in the states involved knew little about the forthcoming evaluation surveys except that some had informally agreed to allow federal engineers to examine their systems.

Opinions Differ on Urgency

More than anything else, *Electrical World's* survey revealed an apparent wide difference of opinion between OCD and utility officials as to the urgency and finality of the government plan to establish the warning system. While OCD officials were moving ahead as if the NEAR system was all but an established fact, with utilities eventually owning signal generators and receiving units, the utilities themselves have had no formal proposals from the government.

Some utilities, nevertheless, have started looking at the technical problems involved, and have assigned engineers to learn what NEAR is like, how it will be adapted, and about how much it will cost. This is being done on the assumption that it will become part of their systems, as Paul Visher, director of technical operations for OCD, and others have said. An Edison Electric Institute technical meeting on the subject was in progress as *Electrical World* went to press.

The big question of ownership seems to be hanging just as high as it has been since OCD switched from federal ownership of signal generators to utility ownership several weeks ago. Utilities contacted by *Electrical World* last week had varying opinions on the subject. Most investor-owned companies are undecided until they know whether the signal generators would be allowed as a capital expense. Municipal and cooperative systems definitely favored federal ownership, and several investor-owned companies were just as emphatic in saying they wanted to own anything on their systems (not necessarily including receiving units). State utility commissions contacted were almost unanimous in favoring federal ownership, but most of these replies were the unofficial opinions of commissioners rather than official opinions of commissions.

Ownership Is Big Question

Hardly any of the utilities ventured to speculate on who would own receiving units. Nearly all questions were answered with questions about the complexities of entering what is considered to be the communications field, the problems of being allowed a rate of return on investment, depreciation, and maintenance. The prevailing feeling underlying the lack of answers seems to be a hope that the government will change to a policy of customer ownership—or government ownership—of receiving units. Some hinted that they would be willing to consider aiding with distribution, or maintenance on an exchange basis, if they could be spared the problems of ownership, rates, etc. Maintenance on an exchange basis would amount to exchanging a usable unit for a faulty one brought in by a customer.

Interviewers generally found that the utilities felt they were being pushed too rapidly into a complex situation, but that they were willing to cooperate in any way necessary. However, there were several specific doubts expressed as to the value of the NEAR warning system.

For example, J. J. McDonough, president of Georgia Power Co, said:

"Georgia Power Co will do anything in the world it is called upon to do in the way of national defense. The company has not been requested nor has it agreed to take on the NEAR system, nor has it been convinced that the NEAR system is the way to do the job." Georgia Power maintains it has had no formal proposal, though it was told informally by Visher and Major General George J. Hearn, adjutant general of the State of Georgia, that electric utilities should install, own, and maintain all facilities.

Cites Lack of Cooperation

Smarting from a comment by Visher at a press meeting that Michigan has not been very cooperative, and for that reason "we are looking for states that will be more cooperative," Harry R. Wall, vice president of operations of Consumers Power Co, said the only unwillingness existing is the question of utility ownership of all NEAR facilities.

"We are willing to continue to cooperate under the same circumstances (under which tests and installations to date have been made) to develop the system if the government will provide the facilities. We do not agree with Mr. Visher that the most efficient method to put the system into effect throughout the nation is to have the utilities pay all the costs of installation. Mr. Visher seems to have the idea of attempting to get the different power systems to put NEAR into operation, but there are many problems with which he is not familiar. We at Consumers Power and Detroit Edison Co are willing to cooperate to any degree in Michigan for further tests," Wall said.

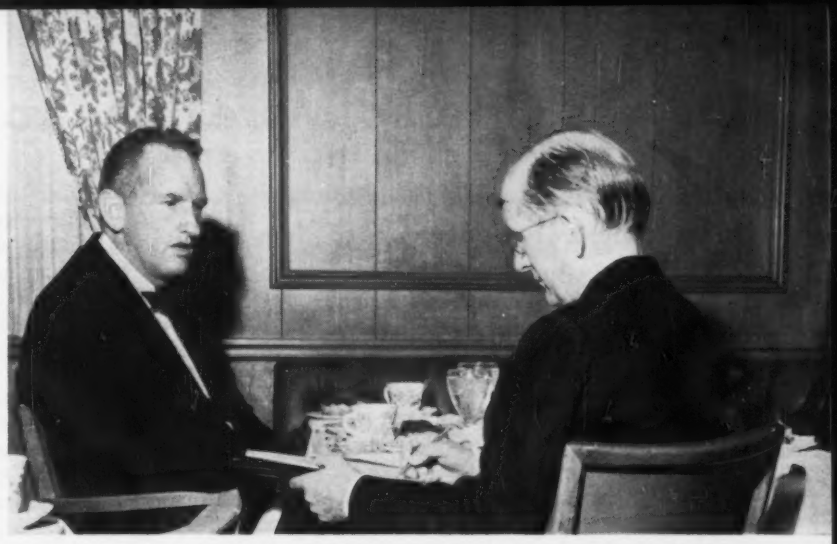
And in Wisconsin, another state receiving OCD attention, Dale F. Hansman, managing director of the Wisconsin Utilities Assn, said:

"What the investor-owned utilities of Wisconsin intend to do

to Utilities

(about NEAR) will be announced at the mid-January meeting" which will be called by William Chipman, director of the Wisconsin Civil Defense Bureau. Any action involving Wisconsin utilities, "a survey or what have you, by the proponents of NEAR, prior to this meeting, would be considered presumptive, and in view of statements at the November 20 meeting (EW, Nov. 27, p 26) a rather unfair approach."

Questioning California utilities, both municipal and investor-owned, interviewers found a definite preference for federal ownership of all facilities. The state PUC, which has met with utilities and OCD officials, will make no comment at this time.



PAUL VISHER TELLS OCD INTENTIONS to Ed Allen of Electrical World (right) in Atlanta. Says utilities are reticent to try new ideas, but some are interested

Government Moving Ahead With Studies

While attending a luncheon meeting of Atlanta business and civil defense leaders last week, Paul Visher talked to *Electrical World's* Ed Allen, Southeastern editor. In the conversation, he confirmed that OCD work in Georgia, California, and Wisconsin had been on an informal basis to work out problem areas.

Visher said OCD wants to test a total system, including signal generation and receiving, and expects to find at least one power system that will cooperate in the full scale test. He said OCD is not prepared to release the system in its present condition until such a test is made.

Program Expansion Planned

It is Visher's opinion that the reaction, nationally, to NEAR (on the part of utilities) has been a reticence to try new ideas. He also commented, however, that individual companies appear to be interested in solving the problems of financing, control, maintenance, and liability.

After the OCD work with Georgia, Wisconsin, and California, Visher wants to expand the activity on a broader base, and has five more states in mind for evaluation studies after the first of the year.

Public utilities commissions in the three primary states have worked with OCD, according to Visher, and want to find equitable ways of handling the problems.

At the luncheon, Visher told the Atlantans that OCD reviewed 30 warning systems and decided NEAR was best. The ones examined included systems made in Germany, Sweden and other nations, besides several made in this country.

He was quite definite in his remarks that the system would be installed nationwide, and also that a reliable arrangement with electric utilities is needed, with utilities taking on the responsibility of buying and distributing receivers. It is his feeling that this is a key point in maintaining a high quality of dependability of the warning system.

Visher repeated for the benefit of the Atlanta audience what he has said before, that about 90% of the total cost of the nationwide system will be in receivers, and that signal generators will cost about $50 million. He said receivers would cost from $5 to $10 a unit.

Studies Announced Earlier

Although awarding of contracts for system evaluation studies in the three states is coming somewhat sooner than some utility people expected, it has been known for some time that Visher intended to do so.

In a letter dated October 30, to Herbert Blinder, staff engineer of the American Public Power Assn, Visher wrote:

"The federal government will provide the services of consulting firms to perform the systems studies for determining the sizes and locations of signal generators required for nationwide signal coverage. The federal government will also provide the appropriate control circuits to the signal generators; the power companies will not be responsible for bringing the warning signal to the NEAR signal generators."

Wants Utility Ownership

As the awarding of the contracts to consulting firms is becoming a fact, it may give more weight to other statements, pertaining to ownership, that Visher wrote in the same letter.

"The (OCD) proposes that the NEAR system be provided as a national attack warning system by the private and public electric power industry, as a service to the public interest. Specifically, the required signal generators will be purchased, installed, and maintained by the power companies. Alarm receivers will be distributed to their customers by the power companies with costs to be recovered through appropriate means such as rate increase," Visher wrote.

At press time recipients of the evaluation contracts had still not been announced by OCD, nor were the second five states named.

Utilities Offered More Time to File Suits

- **Westinghouse extends time in which customers can sue for damages; so does GE**

- **Flow of damage suits continues; State of Washington asks for $52 million**

Westinghouse Electric Corp has offered to extend the time allotted to utilities to file damage suits arising out of the Philadelphia cases.

In a letter sent to customers, President Mark Cresap says the offer was made "to demonstrate our good faith in this matter," and will allow customers more time to study possible damages before determining whether to file a suit.

According to the statute of limitations, the time allotted in which to file suits is (1) four years after the law violations, and (2) one year following the conclusion of both civil and criminal proceedings brought by the government.

The criminal proceedings were completed last February when the companies were sentenced. But the civil proceedings will be completed when consent decrees are signed between the manufacturers and the government. Westinghouse has agreed to the proposed consent decrees but has not actually signed, so the one-year period has not started to run yet.

However, there appears to be some doubt in some utility lawyers' minds, whether in fact the one year period did not start to run last February. To play it on the safe side, therefore, most utilities have planned to file before this coming February.

Now, Westinghouse says it is willing to clear up the doubt and guarantee the one-year-from-consent-decree period, plus more time if it is mutually agreeable.

A General Electric Co spokesman said GE also was willing to offer an extension of the legal one-year grace period to customers who raised the question.

Damages Need Not Be Specified

On another matter in doubt in legal circles, that of specifying actual damages when the suits are filed, Cresap says his company will not require it. "If ultimately there must be a suit, we believe that it is in the best interests of all concerned that exaggerated and misleading claims be avoided," he explained.

The majority of suits filed so far have not specified damages, but some lawyers feel that a suit could be dismissed as "defective" if it did not spell out damages. Cresap now says his company will not seek dismissals on this ground and will guarantee this if the customer so wishes.

More Damage Actions Filed

In new damage actions filed since the 44-utility group suits (EW, Dec. 11, p 50), the State of Washington is asking for more than $52 million in triple damages from ten electrical manufacturers.

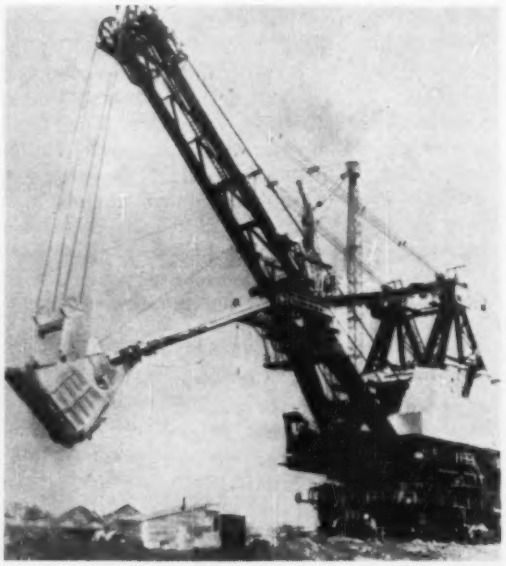
The state filed the suits on behalf of itself, Seattle City Light, Tacoma City Light, Grant and Clark County PUDs, and Grays Harbor PUD.

The six actions involve circuit breakers, distribution and power transformers, turbines and generators, meters, and power switchgear assemblies.

In other damage actions, San Francisco has asked for $1,281,000 in triple damages from five circuit breaker suppliers. The city contends it was overcharged 40% on a $1,067,500 contract in 1959. A second suit involves transformers; damages were not specified.

In the Midwest, eight investor-owned utilities have filed nine suits, supplementing suits filed earlier (EW, Aug. 7, p 13). The companies are Commonwealth Edison Co, Central Illinois E&G Co, Central Illinois Light Co, Central Illinois Public Service Co, Iowa-Illinois G&E Co, Iowa P&L Co, Northern Indiana Public Service Co, and Public Service Co of Indiana. Damages were not specified.

Finally, Consumers Power Co has filed 10 triple damage actions against 22 manufacturers.



Shovel Takes 70-Yard Bite

The shack in the foreground is dwarfed by what its builders claim is the "world's biggest" coal stripping shovel.

The giant shovel, which can move 70 cu yd in one bite or enough to fill the largest railroad car, went into operation early this month at the United Electric Coal Co's Fidelity strip mine west of DuQuoin in southern Illinois. The machine weighs 2,600 tons and took six months to assemble at the site.

News Scope

- *Interior meets with 14-company Missouri Basin group*
- *Capital expenditures to be up next year, government says*
- *FPC hearings end on Marble Canyon project*
- *Hoosier co-op files petition to build controversial plant*
- *Project Gnome runs into trouble*

● **The first meeting between officials of the Interior Department and 14 power companies**—discussing a possible eastern Missouri Basin pool (EW, Dec. 11, p 3)—produced no concrete results. But it will undoubtedly lead to further discussions and a possible firm company offer next spring.

"They were not negotiations," said Assistant Interior Secretary Holum of the meeting, held Dec. 8 in Minneapolis. Milton Chase, who represented Holum there, said "definite progress" was made in two areas: the exchange of information on transmission facilities and on customer loads. From the company side of the meeting table, it was reported that the Bureau found no disagreement with engineering data prepared by the 14-company group.

A spokesman for the companies commented, "We are very well satisfied with the progress made at this first meeting and with the cooperative attitude displayed by representatives of the Bureau of Reclamation. We are hopeful that something fruitfull will develop from further meetings.

Holum and Chase both "look favorably on any plan to firm up Bureau capacity," but they are noncommittal on whether the 14-company plan would be acceptable in its final form. Chase said Interior would want to check the "costs and conditions" in such an interchange agreement.

Both Holum and Chase emphasized that they felt the companies were not prepared to give Interior a definite plan until more complete studies are made, but Chase thinks a definite offer might be made next spring. The Bureau will keep at least one man working with the companies on their plan.

Possible conflict between the interchange plan—to firm up 650 Mw of present Bureau hydro-power capacity—and an alternate plan by Missouri Basin co-ops to build at least one 200-Mw lignite-burning steam plant wasn't resolved at the meeting.

Another problem is whether present Bureau transmission could provide adequate capacity for power interchange with the 14 companies.

● **Non-governmental public utilities' (electric, gas, etc) capital expenditures** during the first quarter of 1962 are expected to be at an annual rate of $5.50 billion dollars, the government reports. This is more than the $5.35 billion rate for the first quarter of 1961, but less than the $5.70 billion rate estimated for the last quarter of this year. For all industries, the government expects capital expenditures will hit a four-year high in the first quarter of 1962, with the possibility of a spending surge later in the year.

● **A petition to build a $60,225,000 power plant and transmission network has finally been submitted by Hoosier Cooperative Energy, Inc** to the Indiana Public Service Commission. The 198-Mw plant would be built with REA loan funds, the largest REA loan ever offered. (EW, June 26, p 42).

Five investor-owned utilities in the area, which say the loan is unfair to them and the power plant unnecessary, will intervene in the PSC hearings, tentatively set for February or March.

● **The FPC hearings on Arizona Power Authority's application to build a 510-Mw Marble Canyon hydro-power project on the Colorado River ended this month** with final outcome very much in doubt. The FPC examiner has fixed Feb. 19 as the deadline for the Power Authority to file its written brief; intervenors and the FPC staff have until April 16.

The final days of hearings were devoted to cross-examination of Los Angeles testimony, which wants an alternate plan for development of the downstream Kanab Creek site. Interior Department would like the case delayed (EW, Dec. 11, p 51).

● **Project Gnome, the five-kiloton underground nuclear shot** to study, among other things, the feasibility of generating conventional electric power from such blasts, ran into trouble. Steam, which should have been trapped underground, escaped. A few weeks will be required for scientists to evaluate their incomplete heat and steam data.

NEMA Takes Stock, Plans for

Washington meeting speaker warns 'Move forward together, or divide and fall'

"NEMA has arrived at a very critical time. Conditions in our industry are far from favorable. Relations with certain customer groups are strained. The profit picture is hazy. We must move forward together or divide and fall by the wayside."

Thus spoke C. W. Mills, Westinghouse Electric Co, to the National Electrical Manufacturers' Association's Generation, Transmission and Distribution Equipment Division recently at Washington, D. C.

NEMA's business development activities are aimed at selling appliances, lighting, electric heating, and many other products, continued Mills, because the products of manufacturers represented in the GT&DE Division are bought only in answer to a need created by customer purchases of electricity-consuming devices.

These activities are designed to supplement the programs of individual manufacturers, Mills continued, and they carry the message of electrification to the public and solicit the cooperation of utilities, contractors, and trade associations in programs of mutual benefit. These activities fall in four categories—residential, commercial, industrial, and rural.

Emphasizes 5 Programs

The residential market has two programs: (1) HOUSEPOWER to promote adequate wiring in existing and new homes; and (2) Medallion Home to promote total electrification in new homes. The commercial market has Keep Pace Electrically to promote adequate wiring, utilization equipment, and utility load in stores, offices, hotels, churches, and apartment houses. The industrial market is served by the Industrial Electrification Council which provides instruction on the application and benefits of electricity in factories.

All four programs are conducted in close cooperation with Edison Electric Institute, Mills added. And the fifth—the rural program—depends heavily upon EEI's farm promotion campaign, NEMA's contribution being certain booklets.

It is absolutely essential that NEMA receive public recognition for the programs it sponsors, Mills continued. To this end, the Business Development Committee has recommended distribution of a brochure telling members' customers how NEMA works to expand their markets.

"Give us full support in developing and implementing a program which will create understanding and appreciation of the work of NEMA and its member companies," asked T. A. Burdeshaw, Southern States Inc.

Electric utilities and the manufacturers who supply them have for many years shown a persistent dedication to supplying better service to the public, he continued. Today's electric service could not have been attained without continuing research and effort by the manufacturers.

Despite this outstanding performance, relationships between the electrical industry and the public have deteriorated, Burdeshaw said. And this deterioration has extended to relationships between manufacturers and utilities. Many utility engineers today show a substantial lack of understanding of NEMA's purposes and activities. This, he said, is a "stinging indictment" of NEMA's members for failing to communicate with customers and their own employees.

The only way NEMA can be justified is through its contribution of greater efficiency to the production of goods and services, Burdeshaw continued. A more diligent effort must be made to improve the public's understanding of NEMA's purposes and achievements. NEMA's Public Relations Committee, he said, has developed:

1. A newsreel of the year's electrical highlights, suitable for television and industry meetings.

2. Posters for display in plants, schools, and other public locations.

3. Script for a 30-min movie dramatizing the use of electrical equipment in many fields.

4. A basic speech, with visual aids, for civic groups.

5. A plaque or medal to be awarded annually to member-company employees for contributions to community activity.

NEMA will no longer seek anonymity, said Managing Director J. F. Miller. It has stepped up its public relations budget 150%, redesigned its seal for greater impact, is opening a West Coast office, and will become more active in items not specifically electrical. But NEMA's activities must be of the sort better done by a trade association than by individual companies and, above all, must be legal, he said.

NEMA has had "a clean record" of compliance with antitrust laws, said Samuel W. Murphy Jr, legal counsel. In terms set up by the Sherman Antitrust Act, a trade association is a combination. Accordingly, it must be most discrete in avoiding conspiracy or illegal contracts. He credited NEMA's policy of open memberships, open records, and no price activities with keeping it out of trouble.

Warns About Labor Studies

Manufacturers today face a new problem in expansion of the Labor Department's staff for an estimated 24 hearings per year under the Walsh-Healey Public Contracts Act, continued Murphy. This act empowers the secretary to determine "minimum" wages in any industry and requires that all members bidding on government contracts pay no less. Recent determinations have exceeded the actual national minimum wage rate, some running as high as $2.80. This determination, Murphy continued, seems to be set at about the mean of all company reports, without regard to regional wage levels, and tends to boost all wages by the spread between the new "minimum" and the usual one.

Hearings have been scheduled for instrument and battery manufacturers, and turbines are under investigation. There are rumors, said Murphy, that switchgear will be involved.

Standardization activities are proceeding with greater efficiency and speed since NEMA's Switchgear Section

Better Future

joined in the reorganization of American Standards Association's C 37 Committee, reported F. W. Bush, Allis-Chalmers Mfg Co.

The new organization, he said, places the chairman and secretary of C 37 in the same capacities on a coordinating subcommittee comprising the chairmen of the various bodies which make up C 37. This arrangement provides more work sharing and less duplication.

NEMA has referred proposals for higher utilization voltages back to each section for review, Bush continued. Their replies will be reviewed by the Codes and Standards Committee and reported to the Board of Governors, he said.

Bush called for a broad NEMA policy reflecting all divisions' interest in the National Electrical Code for which he saw "the possibility of eventually evolving into an all encompassing document."

The GT&DE Division directors elected Louis J. Ott, Ohio Brass Co, chairman to succeed C. H. Bartlett, Westinghouse Electric Co, who had chaired the division since its founding. J. F. Chipman, Allis-Chalmers Mfg Co, was named vice chairman.

LOUIS J. OTT (left), Ohio Brass, was elected chairman, and J. F. Chipman, Allis-Chalmers, vice chairman

Steam Unit Advances Told PCEA at Honolulu

Steam turbine development anticipates still higher efficiencies, larger capacities, and the use of automatic control systems, the Pacific Coast Electrical Association was told recently at Honolulu, Hawaii.

"We are working now on the development of tandem compound machines rated up to 500 Mw and on cross compound units up to at least 1,500 Mw at voltages in excess of 30,000 kw," W. M. Wallace, Allis-Chalmers Manufacturing Co, told the conference.

"The units," he continued, "will make available a more simplified, compact, unitized construction. Improvements in blade design, lubricants, generator conductor cooling, excitation systems, and control will further contribute to increased performance and reliability.

"We have completed the development and construction of a small MHD generating unit which is now undergoing preliminary tests. We have been engaged in the design study and economic evaluation of a 300-Mw plant which will employ this concept as the 'topping' component.

"From the results of this program, it will be possible to predict the commercial characteristics of this concept applied to electric power generation," Wallace averred. "Our research scientists talk of 25 to 30% reduction in fuel consumption in a large unit, if reliable operation at 5,000F can be realized."

W. H. Rowand, Babcock & Wilcox Co, said that he anticipates that "expected load growth will create a demand for 3-million kw (boiler and turbo-generator) units by 1980." This prediction, he said, is based on limiting the largest size unit on a system to about 10% of system total capacity.

Sees Cost Down 10%

"We believe that a gradual increase in units of this size is feasible," Rowand continued. "If fuel cost, which has been relatively stable for about five years, resumes its rapid rise, steam conditions can be expected to approach 6,000 to 10,000 psig and 1,600F by 1980."

Viewing the future of the supercharged steam turbine-gas turbine combined cycle optimistically, Rowand declared: "This cycle employs a boiler with its furnace at about 100-psig gas pressure, in which the fuel is burned with low excess air between the air compressor and the gas turbine.

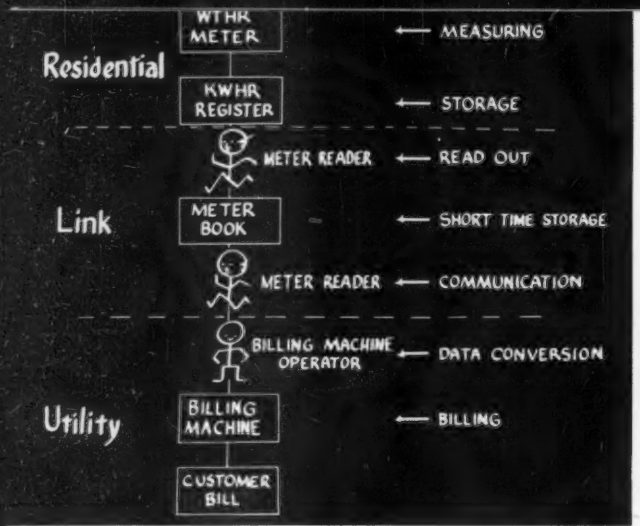
"The boiler, in addition to generating and superheating steam for a steam turbine, supplies high-pressure hot gas to a gas turbine which drives the compressor and a generator. The exhaust gas leaving the turbine passes through a conventional feedwater heating economizer and then through a lower-temperature feedwater heater, where it is cooled to stack temperature.

"The steam flow to the turbine, for a given new plant output," Rowand went on, "is reduced by about 15% below that required for a steam cycle. This lower steam flow, together with the improved heat transfer which occurs at high gas pressure in a supercharged boiler, reduces the size of the boiler. The decreased steam flow also results in a smaller steam turbine, condenser, and feedwater system.

"Indications are that these factors, when combined with several other plant features, may result in an installed cost per kw as much as 10% below the cost of a conventional steam plant. In addition, the improved cycle efficiency will reduce the heat rate about 4 to 5% below that which would be obtained from a conventional cycle with the same steam conditions."

Urging electric utility people to abandon the idea that they are "solely in the business of selling electricity," Walter Lucking declared:

"Let me make it clear now that Arizona Public Service Co is committing itself to being a total-energy company."



MANUAL SYSTEM of meter reading is slow, but has been developed to provide this sequence of essential steps

Automatic Meter

By-product uses, such as load analyses and load switching to shave peaks, are needed to justify utility acceptance

MARTIN W. HELLAR, JR, Manager, Advanced Development Engineering, Meter Dept, General Electric Co, Somersworth, N. H.

Without auxiliary functions, an automatic meter-reading system cannot be justified economically today for utility company use. Several such systems have been proposed. But on the basis of its own investigation, General Electric Co is convinced that automatic meter reading is not "just around the corner."

Someday additional functions and the extra data generated for lower-cost system operation and control will attain enough real value to warrant a total system of which automatic meter reading will be part.

Goal No Incentive

But an average annual meter-reading cost of $1 per meter per year is too small a quarry in the over-all economic landscape to justify only automatic reading. This expense is equivalent to, and hence its elimination would justify, an investment of $8 based on a capitalization rate of 12½%. The investment, of course, would include the purchase and installation of the equipment. Factoring in some intangible benefits, the break-even investment allowable might go to $12 per metering point, but hardly higher.

Any project comprising meter modification affecting the meter's torque would probably involve a changeout, shop modification, and a calibration check. The expectable costs per meter are these:

Meter changeout	$2.50
Accounting changes	1.00
Shop modification and calibration	3.50
Total	$7.00

These estimates are based on mass-programed changeouts, the data having been supplied by several utilities. Obviously, when meter modification costs this much, little money is available for buying equipment for a job evaluated at $8 to $12 per meter.

Meter modification costs could be reduced if a meter-reading system installed by field modification not affecting the meter torque were available. The $1 accounting charge, part of the changeout outlay, and the calibration part of the shop modification cost could probably be dropped. This would give, as a minimum figure, $3 for installing a meter-reading attachment. Based on a permissible range of investment of $8 to $12, between $5 and $9 per meter would be left for total equipment purchase and system installation. Only $1 to $5 would be available for shop modification.

The economic feasibility of a basically high-speed-interrogation method of meter reading which provides additional operating functions has been investigated by GE. Metering points would keep track of one unit of energy at a time, and interrogation, tabulation, and integration would be performed at a central office. Frequency of interrogation would be such that no meter uses more than 1 kwhr in any interrogation period.

This method dispenses with meter identification numbers in billing and would allow manual verification. Features tending to make it economically attractive are these:

1. Development of demand data from each metering point.
2. A communication link for system load control.
3. Provisions for system growth.

Components Needed

Any automatic meter-reading system has encoders, or transducers; a communication link; a reading, or control center. GE assumed that transducers must be inexpensive because each metering point needs one. They must also:

1. Be bi-stable.
2. Be passive.
3. Change state each time 1 kwhr is used.
4. Integrate only 1 kwhr.
5. Be adaptable to present meters.
6. Be reliable.
7. Be simple to install.

The only communication link to each house or metering point known to be reliable is metallic. Hence, GE elected to design a wire communication link trunked to minimize the wire per metering point, as no way is seen today to use the existing power system and meet economic and functional objectives. The layout is based on 100-point party lines with ten lines linking 1,000 points to each section.

On the assumption that each metering point has 240-v, 3-wire, 200-amp service, GE proceeded to put numbers on its system. Its in-

Reading Not 'Just Around Corner'

terrogation period, for instance, is 75 sec, so that energy use does not exceed 1 kwhr between periods.

In the transducer, GE put a resonant circuit having two values of impedance at its resonant frequency, thus fulfilling the bi-stable prerequisite. The two levels of impedance result from changing the Q of the resonant circuit by switching a resistor. This resistor is shorted out by a contact device connected to the watthour meter in such a way that, depending on the meter disk's position, a high or a low Q current flows at the resonant frequency. Thus is signified one or other of two stable states, zero or 1.

The transducer on each meter on a 100-party line, the latter actually a pair of wires similar to telephone drop cable, is tuned to a different resonant frequency. By scanning the line with a variable frequency and measuring the line's current as a function of the frequency, each Q is determined. Thus, the status, zero or 1, of each meter is obtained.

The proposed scan frequency is 4 to 50 kc; the scan rate such that a line is swept in 7.5 sec, ten lines in 75 sec. Each section serves and scans ten lines, each line having 100 metering points. The over-all layout for serving 60,000 metering points has 60 such sections.

Scans Continuously

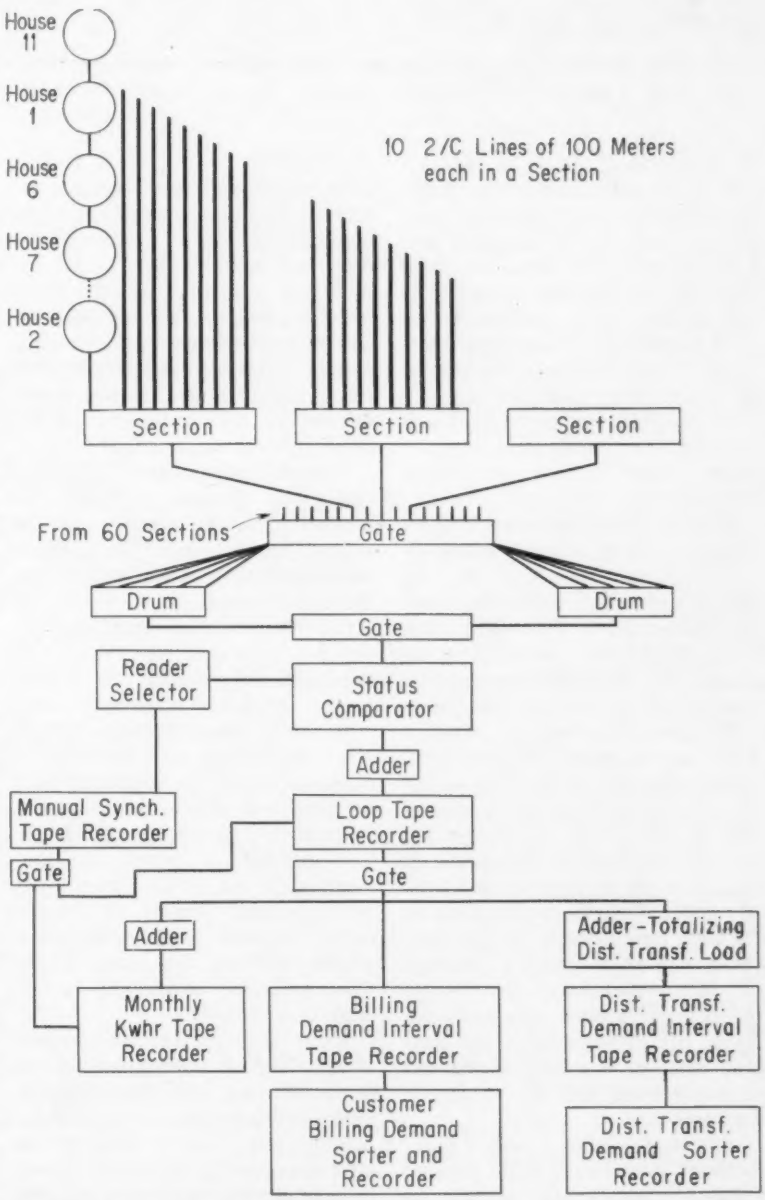
Such a system, then, is set up to scan all Line 1's on each section simultaneously, all Line 2's simultaneously, and so on until all ten lines have been scanned. This takes 75 sec of scanning time, at the end of which scanning starts over and the process goes on continuously.

Section equipment, solid-state devices in a box mountable on a pole, performs a stepping-switch function and provides a means of measuring the current as a function of frequency. Thus the status of each point is determined and sent back to the reading center.

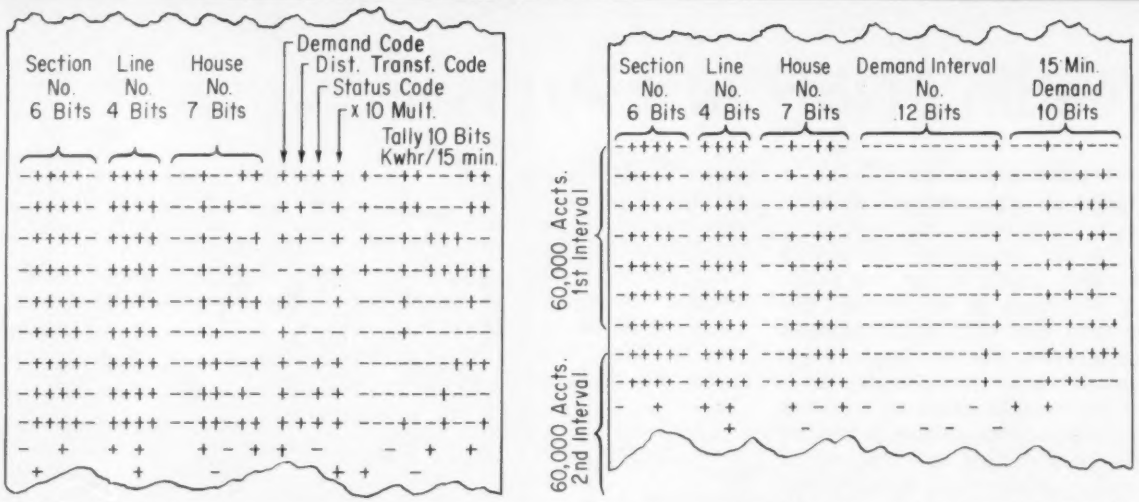
Inputs to the reading center are 60 pairs of wires, each pair from a separate section serving 1,000 meters. Accordingly, input data are in the form of 60 lines simultaneously reporting the zero or 1 status, in sequence, of 1,000 meters on each line. For the first 75 sec, the information is recorded on magnetic drum No. 1, each section having its own channel on the drum where the 1,000 statuses are recorded for that line.

After drum No. 1 is charged up from the first 75-sec interrogation period, the 60 lines are switched to drum No. 2. During the second 75-sec, information on drum No. 1 is read off in sequence, line by line, to the loop tape-recorder. The latter is the first point of tabulation of kwhr usage for each of up to 60,000 meters.

In placing information on the loop tape, the first step is a check



AUTOMATIC SYSTEM must provide same functions as the manual but via metallic links to the "reading center" which interrogates each meter at 75-sec intervals, records and integrates all data, and assembles billing input information



LOOP TAPE (left) automatically tabulates each meter's status every 75 sec to catch each kwhr advance. It's accumulation, read at 15-min intervals, is transferred to the kwhr tally and to demand tape (right) for billing

on the status of the meter, whether zero or 1, and whether that status has changed since the last interrogation. A changed status means that 1 kwhr is added to the accumulated score for a particular meter. The tape record has a position on its 20-ft length for each metering point. Every 75 sec the tape travels a complete revolution, and the score of each of 60,000 metering points is checked. The loop tape recorder stores energy readings over a preselected time.

If kwhr billing information alone is required, then it is only necessary to extract the totals from the loop tape recorder at the end of the specified billing period. This information is transferred to a kwhr tape recorder, the loop tape recorder is erased, and the process repeated.

If block-time-interval demand data are required on individual meters or groups of metering points, the energy readings are extracted from the loop tape recorder at the end of each demand period. All of these interval readings are individually added to the previous scores on the kwhr tape recorder. Any of these same individual interval readings can be simultaneously recorded on the demand-interval tape recorder. As in the previous case, the loop tape recorder is erased at the end of the interval and the process is repeated.

Effectively then, this latter method produces 2,880 demand interval readings (for 15-min intervals) per metering point per month, which are sorted and regrouped point-by-point from the time-by-time record. It is technically possible to sort so much information in a one-month period by conventional tape scanning and play-back methods. But, in the future, new techniques, possibly disc-memory files or thermoplastic recordings, can be expected to simplify sorting. This demand information for part or all of the metering points can be produced in addition to the monthly kwhr usage record.

Metering points can be grouped, and group demand recorded. For instance, meter points can be grouped according to the distribution transformer serving them. From the tallied scores, the 15-min demand on the transformer can be derived. Any time interval can be used, and the grouping can be with respect to feeders, substations, subdistribution points, or even generators. Pre-sorting and pre-calculations can reduce the volume of data for final processing by the computer.

Relatively simple equipment can sort distribution transformer demand data for certain maximums during specific periods, or for one or two intervals. Such condensation greatly reduces the data finally printed out for engineering or operating departments.

Kwhr readings can be verified visually with special procedures and equipment. An additional magnetic tape containing the kwhr register readings must be kept. Each month after the monthly kwhr tape is used to produce the customer's bill, the readings are used to update the register tape.

The metallic link to each metering point can also be used for sending special control signals. Thus, when ten frequencies are assigned for control purposes, functions down to a resolution of ten metering points can be controlled. In this way a communication link is provided for the exact control of such loads as off-peak water or house heating. These loads need not be dumped at set times, as happens with time switch operations, but are removed from the line for system peak-load conditions only.

Other signaling and control functions could include street lighting, capacitor switching, and circuit breaker position indication.

Prices of the major elements of such an automatic meter-reading system, as quoted with the last year, are:

	Unit	Per Meter
Transducer	$8.20	$8.20
Section equipment (1,000 meters)	1,000.00	1.00
Reading center (for 60,000 meters)	148,000.00	2.46
Communication wire	27.50/1,000 ft	5.25
Total equipment cost per metering point		$16.91

Adding installation cost to material at $16.91 per meter, the total installed cost is $32.16 per metering point.

Several utilities have attempted to evaluate the additional functions in terms of the maximum annual ex-

(*Continued on page* 126)

Orients Distribution Computer Data

General program for processing distribution operating data is based on grid locating points in 10-ft squares

G. P. RHOTEN, Senior Design Engineer, General Office Engineering Department, Texas Electric Service Co, Fort Worth, Texas

Digital computers and related equipment have been marshaled by Texas Electric Service Co in its attack on a major distribution problem: How conveniently, efficiently, and economically to collect, store, and analyze all pertinent data associated with a distribution system. The utility is doing this job with its general program for processing distribution data on an IBM 650 computer and peripheral equipment.

The program was evolved by TESCo personnel, assisted by R. L. Smith Jr, Dr Silvio Navarro, and R. E. Kilmer of Texas A&M College Data Processing Center. The program is being applied by stages in all of TESCo's 13 distribution headquarters' areas. The entire program is in operation in several and the others are scheduled to be "on the computer" late this year.

The program is in six sections, each sharing these common data:

1. An addressing and locating system
2. Accumulation and maintenance of principal data
3. Intermediate data processing
4. Load monitoring programs
5. Miscellaneous statistical analyses
6. Analysis of trouble and service interruptions

The foundation for the program is a grid system on which any distribution property or equipment, pertinent point, or customer can be located for computor processing. Establishment of the addressing and locating system required a grid system covering the entire TESCo system, which is about 450 miles long and 100 miles wide.

A basic grid 1 million ft square was established. Within this area it is possible, using coordinate units equal to 10 ft, to locate any 10-ft square by a ten-digit number. Three such grids cover all of TESCo's system. To keep it simple, longitude lines were assumed to be parallel, resulting in an insignificant error.

Evolution from the 20-in.-square grid map, on which 1 in. equals 50,000 ft, to the base street maps scaled at 1 in. = 100 ft, is shown in Figs 2, 3 and 4. Each basic grid map was divided into 100 squares, each square being assigned its identifying coordinate number. Each square then was enlarged to a 20-in. square to form the next series of maps (Fig 3). The process was repeated until the base street map with 100-ft scale was obtained.

The base street map is suitable for

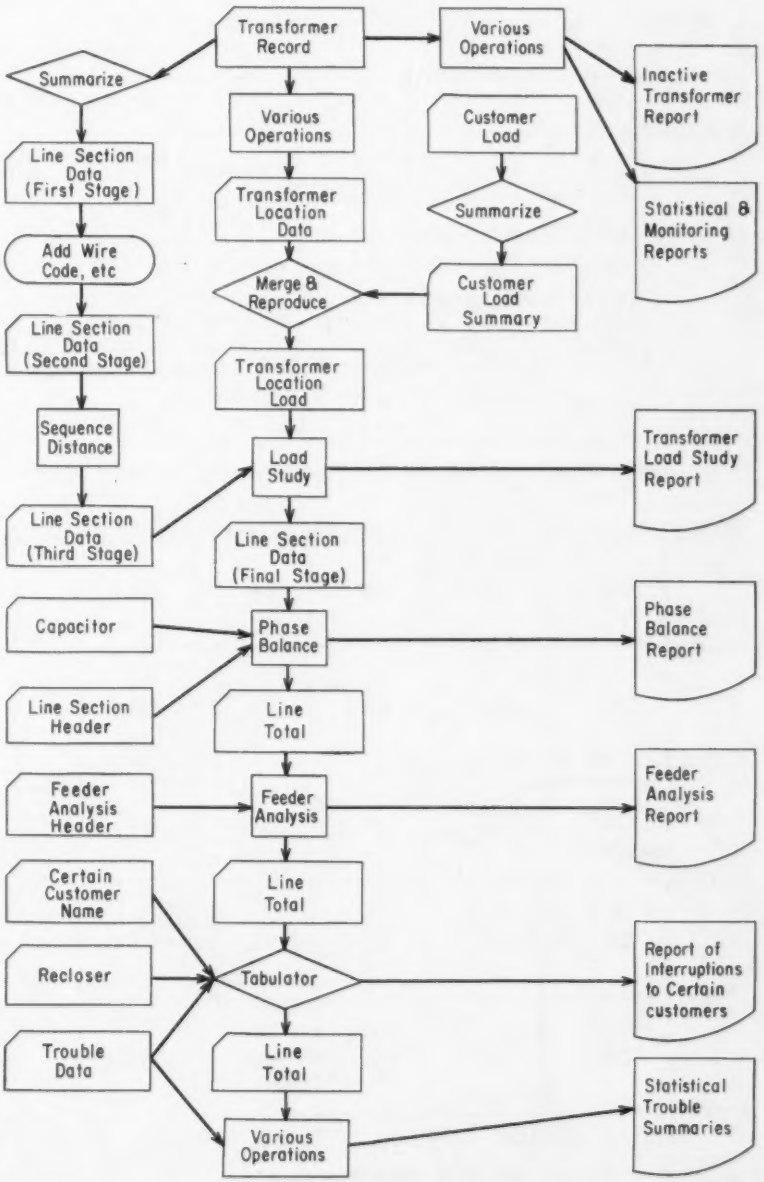


FIG 1—GENERAL PROGRAM FOR PROCESSING DISTRIBUTION DATA uses IBM 650 to convert punchcard input for system loading and performance analyses

mapping all distribution details on a standard 26½ by 22-in. sheet. The 100-ft scale is used for detail maps of dense areas, a 500-ft scale for detail maps of rural areas. Similarly, 500-ft, 1,000-ft, and 5,000-ft scales are suitable for primary maps.

Investigation of many map scale schemes showed this series to be the only one covering the desired range in which the map sheets of a larger scale "nest" perfectly within the map sheet of the next smaller scale. In this series, the match lines of each sheet fall on even coordinates.

US Geological Survey maps, used as a "control," maintain over-all accuracy and permit isolated map sheets to be placed correctly within the coordinate system. To facilitate the establishing of match lines for any sheet within the system and insure against errors in arithmetic, a digital computer prepared a "mapping index".

Because complete conversion of existing maps to this system will require several years, grid lines (establishing the matchlines for new sheets) were located on existing maps. This permitted work to continue on other stages of the general program.

The utilization of thousands of bits of distribution data and information requires reduction by successive condensations and summarizations into units suitable for comprehensible processing. This is the fundamental concept which motivated the entire general program.

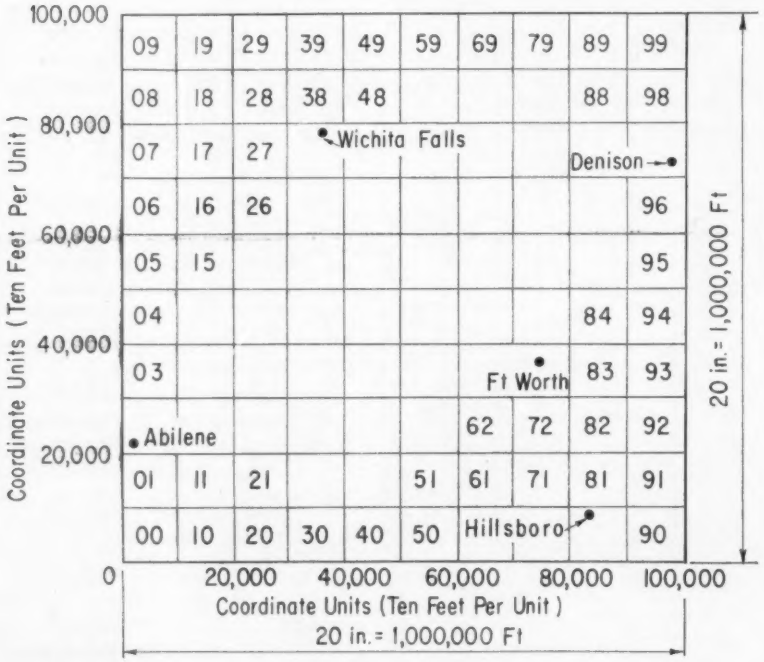


FIG 2—MAP SYSTEM starts with 100-square grid covering 1-million-ft square

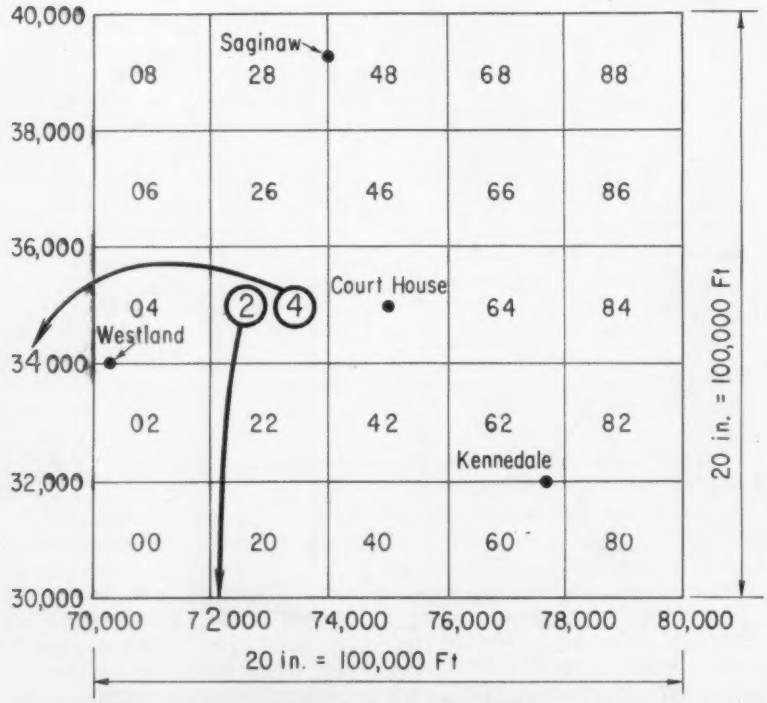


FIG 3—AREA KEY MAPS are drawn by enlarging each square (Fig 1) to 20x20-in

Points Identified

Each primary circuit is divided into parts, averaging about 100 per feeder, by "line section points" at corners in the line, changes in conductor size or number of phases, large spot loads, major junctions, larger capacitor banks, switches, line fuses, etc., and certain customers. Each point is identified and located by its coordinate "line section number".

For example, examine Feeder No. 84 in Fig 3. At the substation there is a point at the secondary bus, at the feeder OCB, and at the terminal pole outside. Only the first four digits, "x" and "y," are geographically significant, each point being located only to the nearest even ten coordinate units (100 ft).

This means that the fifth and the tenth digits are zero except when used as code numbers, as described later. The number of phases is symbolically coded (3-phases by a solid line; 2-phases by a dashed line; and, single-phase by a dot dashline), and phase identification is also on the map.

The next system level below "line section" is the individual transformer. Certain name-plate, historical, and current application data

for each transformer are punched into a "transformer record" card. The location number is a ten-digit coordinate number locating each transformer to within 10-ft. This number is recorded on the detail distribution map and punched into one customer load card for each customer connected to the transformer secondary.

The transformer change authorization (TCA) is source document for maintaining transformer record cards. It contains information entered by the distribution engineer and the foreman making the change. It must be meticulously processed. Space is provided in the transformer record card for manual entry of various information not requiring that the card be punched again.

At the next system level below the distribution transformer is the individual customer. The program uses a load card for each customer. Information is punched into this card in two stages. The customer's account number, service address, kw demand (if any), kwhr, town, revenue code, and phase (single or 3-phase) are recorded from billing. The transformer location number is furnished by distribution personnel from maps or field check.

Stages Pyramid

In essence, the data processing portion of the general program begins at the customer and condenses enormous quantities of data in logical pyramiding stages. Individual customer data are summed at the transformer location, these values are sub-totaled by line section and summed in correct electrical sequence up to the substation.

The kw and kwhr recorded in each customer load card and the number of customers are summarized by machine, the transformer location number being used as a control, into a customer load summary (CLS) card. There is one CLS card per transformer location. The kw demands are recorded in four categories: Single-phase; 3-phase residential; 3-phase commercial; and 3-phase industrial. The two kwhr totals include only the energy consumed by customers for whom there is no kw reading. The number of customers (single and 3-phase) is recorded in this CLS card.

To allocate correctly by machine methods the transformer loads to the proper primary phases, certain logic must be provided from the transformer record cards. One transformer location data (TLD) card is produced for each location by summarizing the transformer record cards, the transformer location number being a control. This card contains all pertinent data together with the primary voltage rating and the number of transformers

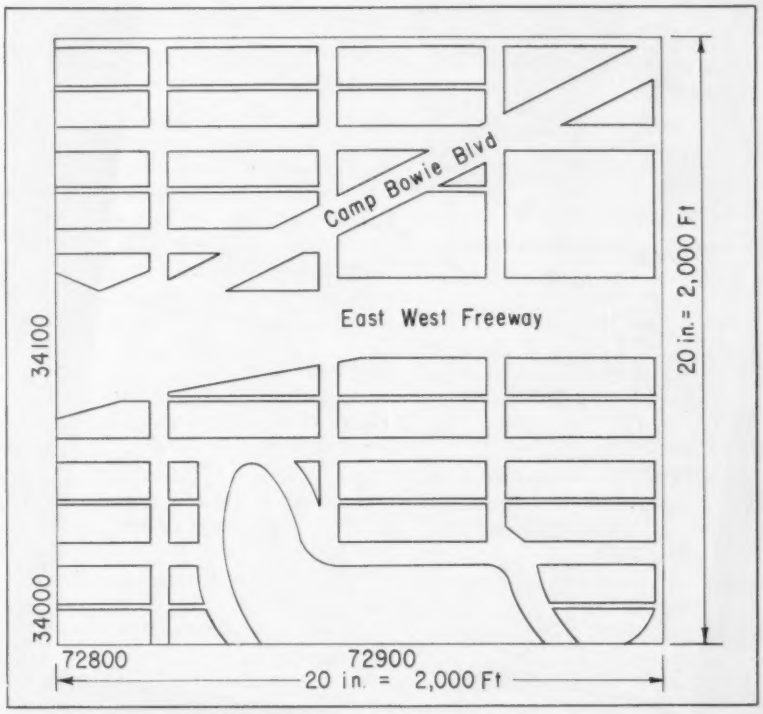


FIG. 4—**FINAL ENLARGEMENTS** show streets. 10-ft square has 10-digit coordinate

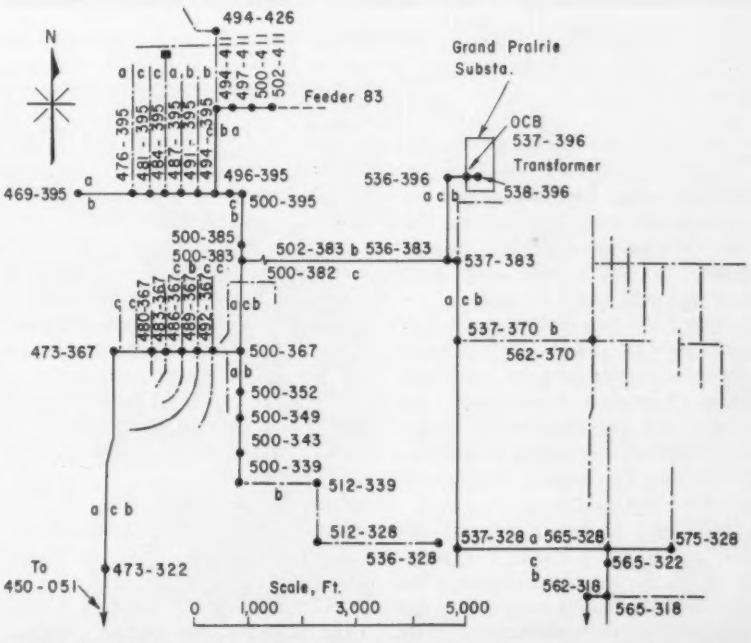
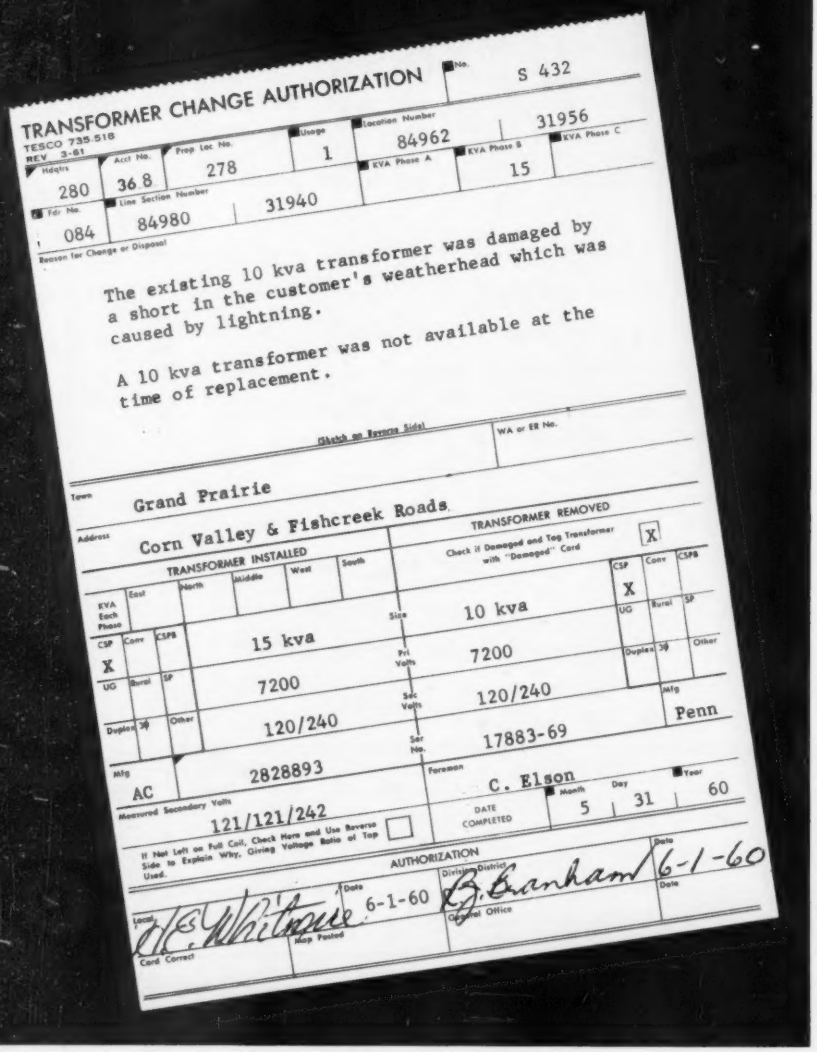


FIG 5—**PRIMARY FEEDER MAP** designates key points by nearest coordinate units



TRANSFORMER CHANGE AUTHORIZATION

TESCO 735.518 REV 3-61

No. S 432

Hdqtrs 280 | Acct No. 36 8 | Prop Loc No. 278 | Usage 1 | Location Number 84962 | 31956 | KVA Phase A | KVA Phase B 15 | KVA Phase C

For No. 084 | Line Section Number 84980 | 31940

Reason for Change or Disposal

The existing 10 kva transformer was damaged by a short in the customer's weatherhead which was caused by lightning.

A 10 kva transformer was not available at the time of replacement.

Sketch on Reverse Side | WA or ER No.

Town Grand Prairie

Address Corn Valley & Fishcreek Roads

TRANSFORMER INSTALLED

KVA Each Phase: East | North | Middle | West | South

CSP X | Conv | CSPB

UG | Rural | SP

Duplex | 3Φ | Other

15 kva | 7200 | 120/240

Mfg AC | 2828893

Measured Secondary Volts 121/121/242

If Not Left on Pull Coil, Check Here and Use Reverse Side to Explain Why, Giving Voltage Ratio of Tap Used.

TRANSFORMER REMOVED

Check if Damaged and Tag Transformer with "Damaged" Card X

CSP X | Conv | CSPB

UG | Rural | SP

Duplex | 3Φ | Other

Size 10 kva

Pri Volts 7200

Sec Volts 120/240

Ser No. 17883-69

Mfg Penn

Foreman C. Elson

DATE COMPLETED Month 5 | Day 31 | Year 60

AUTHORIZATION

Local Office: Card Correct J.C. Whitmire Date 6-1-60

Map Posted

Division District: B. Branham Date 6-1-60

General Office

FIG 6—**TRANSFORMER CHANGE AUTHORIZATION** is the source document for transformer record cards which list name-plate, historical and application data

at the location. Using the primary voltage rating, number of transformers, and phase kva, the correct percentage of single- and 3-phase load to be assigned to each primary phase is determined and gang-punched into the TLD card.

The third step combines the CLS card with the TLD information in one transformer location load card. Thus, from two basic cards, customer load and transformer record, the transformer location load card is produced by rapid, inexpensive machine methods.

For each of the increments into which a primary feeder is divided, as in Fig 5, there is prepared a line section data (LSD) card. The first step involves the summarizing of the transformer record cards, the line section number being used as the control. The summary is a partially complete LSD card. There are two general types of these:

1. The first includes all line sections where the card represents a length of line from one line section point to the next, *i.e.*, transformers are distributed along the increment of line. These are identified by a zero in the fifth and tenth digit of the line section number.

2. The second includes all line sections where the card represents some "point load" on the line located. These are identified and separately classified by fifth and and tenth digit code numbers.

At this stage the LSD card contains only the line section number, the sum of connected transformer nameplate kva (total and by phase), the distribution headquarters, and the feeder number. Using primary maps, distribution personnel determine the "next line section number" (toward the substation) and the four-digit wire code. The first digit denotes number of phases and neutral size; the second, type of conductor; and, the last two, conductor size. This information is key-punched into the LSD card.

In the sequence-distance program, the computer calculates the length of line section using the two line section numbers in each card. The program also aligns all the LSD cards for each feeder in their correct electrical sequence, from the end of the line toward the substation, and punches the "card number" (electrical sequence number) in each card. The last stage in the evolution of the LSD card occurs later.

Load Relief Indicated

The larger mass of customer, transformer, and line data has, at this stage, been substantially reduced and recorded into two types of punched cards: The transformer location load, and line section data. These cards are input for the computer in a program which prints out a transformer load study report and completes the LSD cards.

The result of the load study program is the amount of single-phase and 3-phase statistical kva load (KVAS) assigned to each primary phase. This KVAS is expressed as a percentage of the respective kva rating of the transformer (KVAT). An asterisk, alongside each percentage exceeding a maximum, indicates need for load relief. As the program calculates these loads at 100 transformer locations per min, it simultaneously completes the information carried in the LSD card. The KVAS is summed and recorded (total and by phase) as a percentage of KVAT.

For later use in interruption studies, the number of customers in each line section is recorded in the LSD card in seven categories. "ABC" column gives the total number. The remaining six columns reflect the percentage of the total number which would suffer a service interruption with the loss of any one phase or any combination of

(*Continued on page* 126)

Longer Transformer Use Justifies Capacitors

Sangamo seminar speaker cites post-application improvements; meeting hears of capacitor control developments

Installation of secondary capacitors is justified economically by the extended use of transformers already on the line, the Sangamo Electric Co's fourth annual seminar was told recently at Clemson, S. C.

This statement by V. P. Juselis, Hartford Electric Light Co, was bolstered by citation of computer study results. The studies considered these consequences of secondary capacitor installation on distribution:

1. Higher revenues from improved voltage

2. Release of transformer capacity

3. Reduction of losses.

Any company planning similar studies, Juselis noted, should include its own transformer loading, rate of load growth, carrying charges on investment, and such other factors as change from company to company.

Capacitors and reactors have been combined on the Arizona Public Service Co's new 345-kv lines between Phoenix and the new Four Corners Steam Station, said W. H. Croft. The lines are 292 miles long.

The combined installations, he said, establish system stability and voltage control. The reactors are at several points, and the capacitors at load points where they minimize var transmission. Capacitors are both series and shunt.

Voltage regulation is the sole function of switched capacitors on the Pennsylvania Power & Light system, said W. U. Baum. Automatically switched capacitors are applied near loads on distribution feeders after generator voltage schedules have been assigned and substation transformer taps set for light-load conditions, Baum continued, adding that capacitors are also applied on single-phase taps because they are cheaper than extra phase wires.

PP&L uses capacitors for regulating voltage, he said, because they do the job for $3 million instead of $6 million for regulators. Furthermore, the capacitors permit the use of 96%-pf generators, he added.

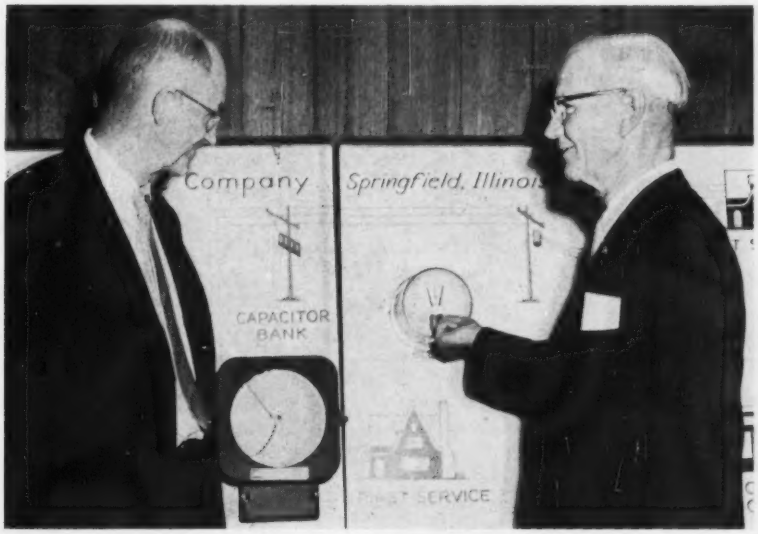
L. F. MEISENHEIMER says Duke Power Co needs capacitors to serve its loads

Complex controls, which broaden the benefits and eliminate the disadvantages of capacitor applications, were developed by engineers when they recognized the advantages of such applications, declared W. C. Downing, Sangamo. Such controls, he said, may combine voltage override of the time switch, voltage override of var controls, current override on voltage controls, and current bias on voltage control to establish sequence switching of two or more banks. Some controls, he added, connect capacitors when they are needed and disconnect them when the need is past. Although sequence switching is normally limited to two or three banks, Downing said, one control can switch four banks in sequence.

Downing noted that a recent inquiry concerned a voltage-sensitive control that would remove capacitors from the line when power has been restored after an outage and keep them disconnected until normal voltage conditions had been restored. The objective is to keep the capacitor switch from closing in on a faulted capacitor when fault current exceeds the switch's capacity. The control would delay several seconds, permitting the capacitor fuse to blow or the breaker on the circuit to operate.

A circuit switcher, combining features of both load interrupter switches and power circuit breakers,

(*Continued on page* 126)



MEASUREMENTS are key to capacitor applications and system planning, P. L. Shelley, Oklahoma Gas & Electric tells Wendell Fowler, Sangamo, at display

Chart Tells Open-Delta Transformer Sizes

FRED C. DeWEESE, Electrical Engineer, Raleigh, N. C.

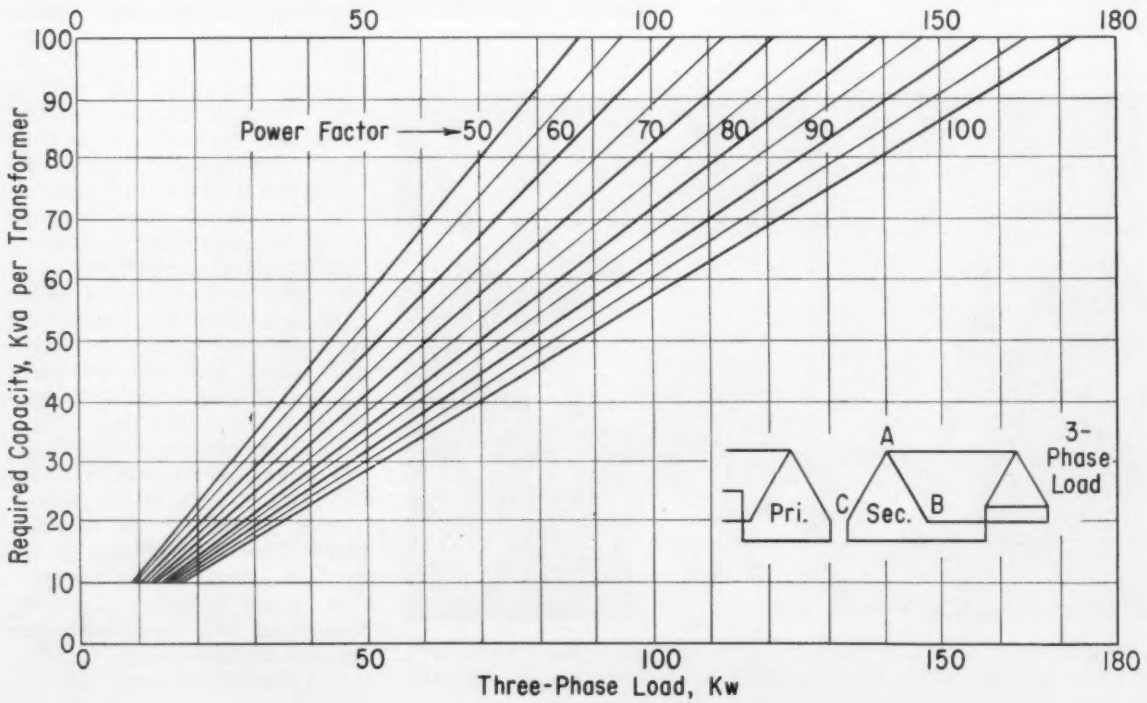
This chart shows the required capacity for each transformer in an open-delta or open-wye, open-delta bank supplying a balanced three-phase load. Line current is equal to transformer winding current, but, because the current at unity power factor is 30 deg out of phase with the voltage, the required kva capacity of the bank is $\frac{100}{0.866} = 115.5\%$ of its load capability.

The required capacity per transformer, then, in terms of the three-phase load is given by the equation:

$$Kva = \frac{1.155 \times Kw}{2 \times Pf} = \frac{0.577\,Kw}{Pf}$$

in which Pf is a decimal.

The curves solve this equation. One decade is shown; for larger or smaller ranges, simply add or delete zeros.



Electrical World Report

NOVEMBER
DECEMBER
1961

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE

'Bare-Hand' Maintenance Works on Live Distribution Systems
Techniques worked out by AEP in the 34 to 138-kv range are expanded to cover distribution down to 12-kv — p 68

Car Battery Speeds Field Tests on Power Transformers
Regulator, 12-v battery, and Kelvin bridge permit fast, reliable tests of TVA's power transformers — p 72

Airborne Noise Reduced 14 Db at Hungry Horse
Enclosures over turbine pits, acoustical materials on ceilings and walls, cut USBR's Hungry Horse turbine-gallery noise to 73 db — p 74

Regular Departments

Construction — p 78
Operation & Testing — p 88
Maintenance & Repair — p 82
Stores & Shops — p 92
Safety — p 94

New Equipment — p 53
Manufacturers Literature — p 96

New HUSKY Ventrib*!

The low cost cable-carrier, quality engineered with Husky experience

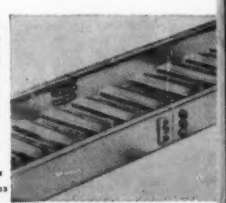
The VENTRIB basket carrier is Husky's new, low cost addition to its growing line of cable support systems. Primarily designed to handle control cable, it is carefully pre-engineered for simple installation. Unusual slotted design provides maximum ventilation while permitting easy banding and/or clamping of cable. The overall corrugated VENTRIB design achieves optimum strength with a minimum of weight. Adhering to the highest standards of Husky workmanship and design, the VENTRIB basket carrier is supplemented by a full line of fittings and support materials.

Available in most popular industry sizes, VENTRIB is stocked for 24 hour shipment. For the latest word on this new Husky system, write for the VENTRIB catalog.

HUSKY - DIV. OF **BURNDY** CORP., 5300 VINE ST., CINN. 17, OHIO

CIRCLE 52 ON READER SERVICE CARD

LIKLOK* Coupling Secures Sections Sound mechanical joint with 3 prong coupling. Ease of installation saves time and money.



*TM 61-33

Safety Hook . . .

. . . locks positively so there is no opportunity for load-holding cable or chain sling to slip out. Available in one and two-ton sizes to fit all hand hoists, hooks open either right or left, and the latch arm swings back so full throat opening is clear for loading or unloading of hook. Latch in closed position can be opened only by manually releasing it; hook trips latch back into closed position. One-ton size has throat opening of 1⅛ in.; 2-ton size, 1¼ in. Either size can be furnished with or without swivel bail.

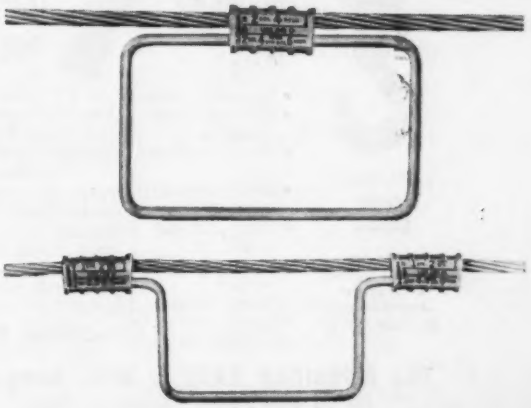
Ratcliff Hoist Co, Box 543, Belmont, Calif. (1)

TV Camera Controller . . .

. . . remotely controls 10 functions of a closed-circuit television camera. The system consists of operator's monitor plus a remote relay assembly at the camera. Control cable between the camera and operator's monitor can be run effectively for 5,000 ft, permitting long-distance, remote observation of plant operation by television. The remote control system uses low dc voltage for control to eliminate the need for conduit or ducts. Various functions that can be remotely controlled are: camera power on/off, electrical focus, optical focus, iris control, turret control, zoom lens, washer/wiper, pan and tilt, speed of pan and tilt, and miscellaneous functions that might be required in an individual system. Both control and remote-relay units are of modular construction, which is said to permit assembly of just the right system for each application without special equipment.

Motorola Inc, 4501 W Augusta Blvd, Chicago 51, Ill. (2)

Compression Stirrup Clamps . . .



. . . save time, offer better appearance and reportedly are more precisely engineered and more economical than field-fabricated units. Hot-line stirrup clamps are applied to the extended bail, away from the main line, preventing arcing damage to the main conductor. They can be used on aluminum or copper main conductors, and are applied with standard mechanical or hydraulic compression tools. Clamps are available in two styles, with single or double H taps, which are factory secured to the bail. Knurled bail ends prevent turning or twisting. The clamps are prefilled with the patented Contax oxide-inhibiting compound to retard corrosion.

Jasper Blackburn Corp, 1525 Woodson Rd, St. Louis 14, Mo. (3)

(More New Equipment on page 54)

The VALUABLE and VERSATILE Tool for Every UTILITY CREW

THE AMERICAN
POWER-PULL
HOIST-PULLER

One Man Can Lift Up To 3000 Lbs.—Easily Quickly—Safely!

STRETCHES
LOWERS
LIFTS
PULLS

Utility Men Tell Us They Use POWER-PULL To...

- Set and guy poles
- Raise and lower materials
- Install transformers
- Install strain carriers
- String wire and cable
- Release or apply tension
- Stretch fence
- Handle reels
- Pull vehicles

¾ • 1 • 1½ Ton Models Tested To 1⅛ • 1½ • 2¼ Tons Weigh only 6½ to 7½ lbs.

Notch-At-A-Time Control Quality Construction — Aircraft cable, plated steel frame, stressed parts manganese bronze.

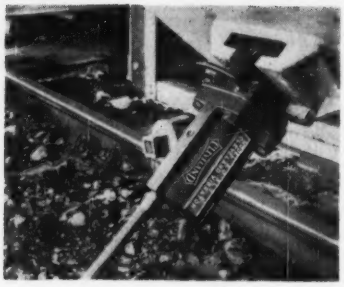
Cadmium Plated

1½ Ton Model Shown

Write for Special Utility Literature and Dealer In Your Area

The AMERICAN GAGE & MFG. Company
125 EW Bayard Street • Dayton 1 • Ohio

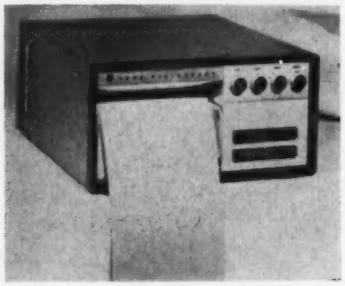
DEALERSHIPS AVAILABLE • WRITE TODAY



Hopper Vibrator . . .

. . . air-powered, piston-type, for emptying railroad coal cars, has vibratory force of over 1,000 lb, yet weighs less than 70 lb. The KO-LSRR, 3 in., features a one-piece vibrator attached to a cast-steel male wedge head, delivers over 1,700 vibrations per min at 60 psig air supply, and will operate on only 30 psig. Both intensity and vibration frequency are regulated by adjusting air supply. Piston is lubricated automatically.

Cleveland Vibrator Co, 2828 Clinton Ave, Cleveland 13, Ohio (4)



Oscillograph . . .

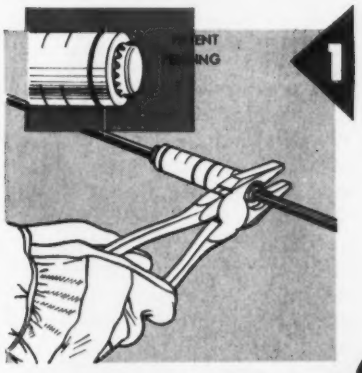
. . . fits 24 direct-recording channels into only 7 in. of rack height. The 1508 Visicorder's channels are recorded on 8-in.-wide paper, with each channel capable of recording individual static or dynamic phenomena at frequencies from dc to 5,000 cycles per sec. All operating controls are on the front panel and any of 12 recording speeds may be selected before or during recording by means of push-button controls. Trace identification interruptions occur each 8 in. of record travel.

Minneapolis-Honeywell Regulator Co, 5200 E Evans Ave, Denver 22, Colo. (5)

(More New Equipment, p 56)

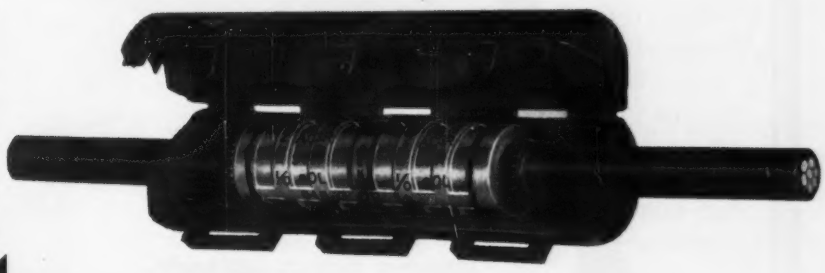
New • • • Quick • • • Neat • • • LOW COST

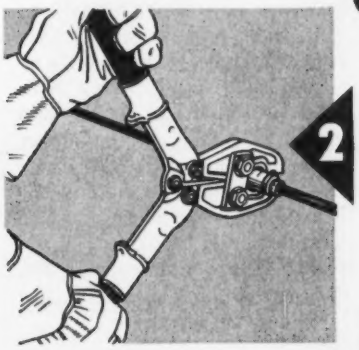
FULLY INSULATED SERVICE ENTRANCE SLEEVES



1

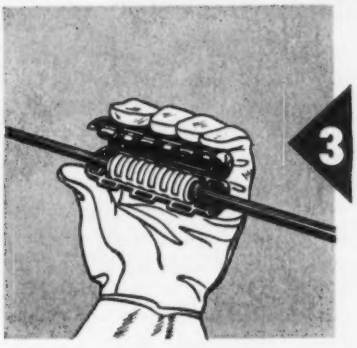
Pinch the exclusive Blackburn Crimp Collar with ordinary linemen's pliers. The pinched collar will hold the conductors firmly in the sleeve, leaving both hands free for easy tool manipulation. Conductors are fed directly into sleeve, insuring complete insertion.





2

Compress directly onto the full diameter aluminum sleeve with any compression tool having a 5/8" die. No insulation to damage. The cover is snapped on after the easy-to-see indents have been made.



3

Insulate Snap on the virgin polyethylene cover as easily as snapping your fingers. Cover has positive snap-locks that fasten it securely. It won't come off until taken off. Rain and condensation cannot be trapped inside cover —corrosion products will not build up. Fits all 5/8" sleeves up to 2 inches long. *Less expensive than taping.*

NOTE: Sleeves and covers may be purchased separately —additional savings if purchased as a unit.

WRITE for prices and Data Folder # 6112.

Jasper

BLACKBURN

Corporation

1525 Woodson Road • St. Louis 14, Missouri

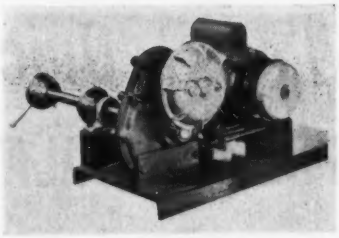
Here's a "unitized" aerial lift — vehicle and lift in one unit and at a low price. The "Hi-Arm" is ideal for overhead work — easy to maneuver, compact, lightweight, flexible, truck-mounted, hydraulic. Available in three different sizes — 28′, 32′ and 36′, with either single or tandem cab. The two-foot-square bucket has a 300-lb. capacity. Operator can step easily from cab to basket. Write for further information and specifications.

UTILITY DIVISION
HIGHWAY TRAILER INDUSTRIES, INC.
STOUGHTON, WISCONSIN

HIGHWAY

Manufacturers of: Public Utility Bodies • Earth-Boring Machines • Pole and Cable Reel Trailers • Side Boxes and G. S. Bodies • Winches • Power Take-Offs • Service Accessories • Commercial Trailers • Dry-Bulk Haulers • Cargo Containers • Land, Sea and Air.

SALES AND SERVICE IN PRINCIPAL CITIES



Cable Winder . . .

. . . provides controlled tension, has simplified construction. Reel-Wynders and winder drives are offered in five sizes which provide winding speeds from 3.5 to 3,500 rpm. Units can be adapted to both existing and OEM equipment; output ratings are from ½ to 3 hp. Design is said to include: 1) Proved fluid-drive which automatically delivers increasing torque and tapered tension over core ratios as high as 8:1, while process speeds may vary as high as 3:1; 2) Two simple controls to provide a wide range of adjustable tensions and speeds; 3) Easy accessibility minimizes maintenance; 4) Large air-cooling fins; and 5) Low inertia driven members coupled with hydraulic cushioning.

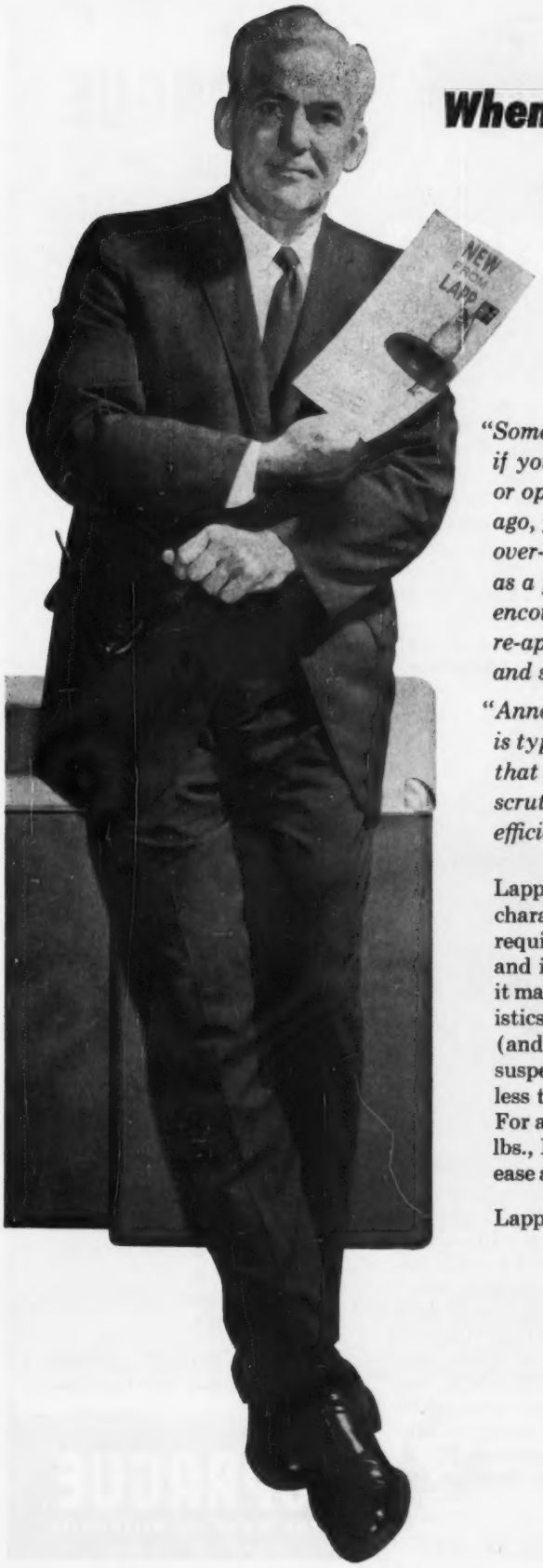
Fluid Drive Engineering Co, Wilmette, Ill. (6)

Snow Detector . . .

. . . operates at remote points, without supervision and only when needed, can activate equipment for removal of falling snow, etc. Reportedly, no adjustments or maintenance are required. When moisture from snow fall or freezing rain collects on the sensing head (a metallic grid which is always heated and will constantly clear itself of moisture), a relay is energized by means of a transistorized amplifier in the control box—if the temperature is below that set on the thermostat. Unit is made for use on 115 v ac, 60 cycle or 12 v dc (on special order) with one sensing head. Second sensing head for larger detection area is optional.

Rails Co, 187 Maplewood Ave, Maplewood, N. J. (7)

(More New Equipment p 58)



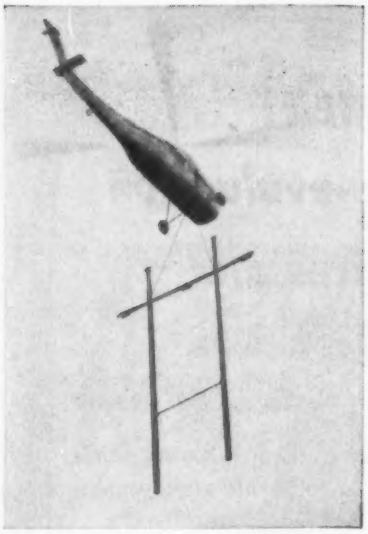
When MANAGEMENT asks for re-evaluation of practices and standards

"Somebody smart has been quoted as saying that if you're doing anything in corporate management or operation the way it was being done 20 years ago, you're probably wrong. That may be an over-stated generality; but the fact is that we see as a principal function of management the job of encouraging every department to re-examine and re-appraise—methods and materials—practices and standards.

"Announcement by Lapp of its **Hi-F** *suspension insulator is typical of the opportunity we seek. We believe that no standard is too sacred to exempt it from close scrutiny in the interests of reducing costs and improving efficiency under changing operating requirements."*

Lapp **Hi-F** is a suspension insulator designed to produce characteristics more nearly in line with ratings—and requirements. It is "non-standard" only in its 9" diameter, and in its strength rating—14,000 lbs. M&E. Otherwise it matches in mechanical ratings—and electrical characteristics—the 10" NEMA standard 15,000 suspension insulator (and is physically interchangeable with all "standard" suspension insulators). It weighs one-third less, so costs less to handle in the field and is simpler for hot-line work. For any installation at working load handling up to 7,000 lbs., Lapp **Hi-F** offers a new standard of economy, ease and efficiency. Look into it!

Lapp Insulator Co., Inc., LeRoy, N. Y.



Keeping Pace with Progress — Haley's uses the most modern plants to produce

— Pentachlorophenol Treated —

WESTERN RED CEDAR POLES

and

DOUGLAS FIR CROSSARMS

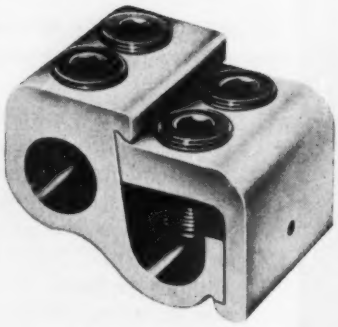
Our modern treating and fabricating equipment, storage yards and shipping service means we can serve you better, faster than ever before.

Plants at
Bellingham, Washington
Minneapolis, Minnesota
and
Findlay, Ohio

R. G. HALEY & CO., INC.
Spitzer Bldg., Toledo 4, Ohio

Two-Speed Chain Saw . . .

. . . has a unique power shift which provides a low speed for easy starting and a fast speed for "power" cutting. Unit has a three-position safety throttle with a trigger to stop the saw instantly and automatically. The C70 saw is available with 17, 21, 25, and 30-in. bars and chains. Its engine, a Wright two-cycle, air-cooled, direct-drive unit, has a displacement of 7.06 cu in. The saw weighs 22 lb (less bar and guide).
Thomas Industries, Inc, Wright Saw Div, 207 E Broadway, Louisville 2, Ky. (8)



Tap Connectors . . .

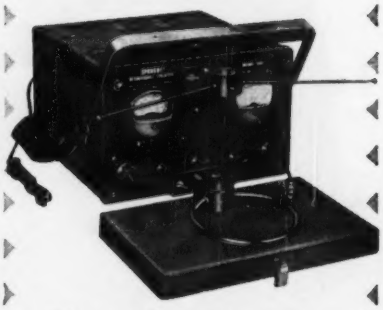
. . . are connected individually to main and tap, eliminating need for wrestling with two conductors and several clamp parts simultaneously. The GTA units are made from high-strength structural aluminum alloy with yield strength of 35,000 psi. Connectors are available in eleven sizes for wire range of 750 MCM, No. 14 AWG. They are approved by UL for use with copper or aluminum in any combination.
Ilsco Corp, 4734 Madison Rd, Cincinnati, Ohio (9)

(More New Equipment, p 62)

SPRAGUE®

MODEL 500 INTERFERENCE LOCATOR

LOCATE rf NOISE SOURCES QUICKLY



This versatile instrument is a highly sensitive interference locator—*with the widest frequency range of any standard available unit!* Model 500 tunes across the entire standard and FM broadcast, shortwave, and VHF-TV spectrums from 550 kc. to 220 mc. in 6 bands.

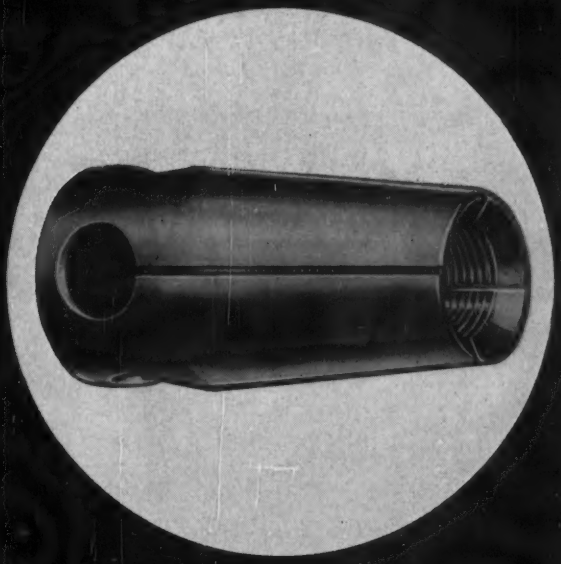
It's a compact, portable, rugged, versatile instrument—engineered and designed for most efficient operation *in practical field use.* It features a transistorized power supply, meter indications proportional to carrier strength as well as sensitivity of 5 microvolts minimum for 5% meter deflection over entire tuning range.

For full details, send for brochure IL-106.

SPRAGUE ELECTRIC COMPANY
315 Marshall Street, North Adams, Mass.

SPRAGUE®
THE MARK OF RELIABILITY

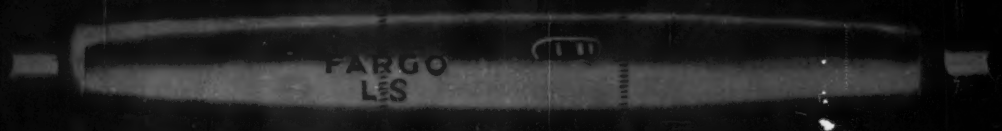
You Get This Same "One-Piece" Jaw in ALL FARGO AUTOMATIC SPLICES



FARGO "AUTOMATICS" ARE AVAILABLE IN COPPER OR ALUMINUM FOR COPPER, ALUMINUM, COPPERWELD, ALUMOWELD, "6201" or "5005".

And Here's Why:

1. The quickest method for joining two conductors . . . just insert the wire fully into the inhibitor loaded jaw and the splice is made.
2. The "one-piece" jaw is made from high strength alloys that give a strong, corrosion resistant, "like metal" grip on the conductor . . . permanent but yet readily reclaimed for use again and again.
3. Precision machining of the "one piece" jaw from solid bar stock assures permanent alignment of jaw segments, which prevents individual strands of the conductor from getting out of place.
4. Because of "one piece" construction, jaw segments flair out slightly as the wire is inserted to give an excellent initial grip on the wires.
5. The jaw and conductor move forward as a unit when tension is applied to complete the grip . . . so it can't let go!
6. The "one-piece" jaw permits a liberal safety zone to be machined into the back of the jaw to accommodate burred ends of the conductor.



Ask your Line Material Field Engineer for complete details.

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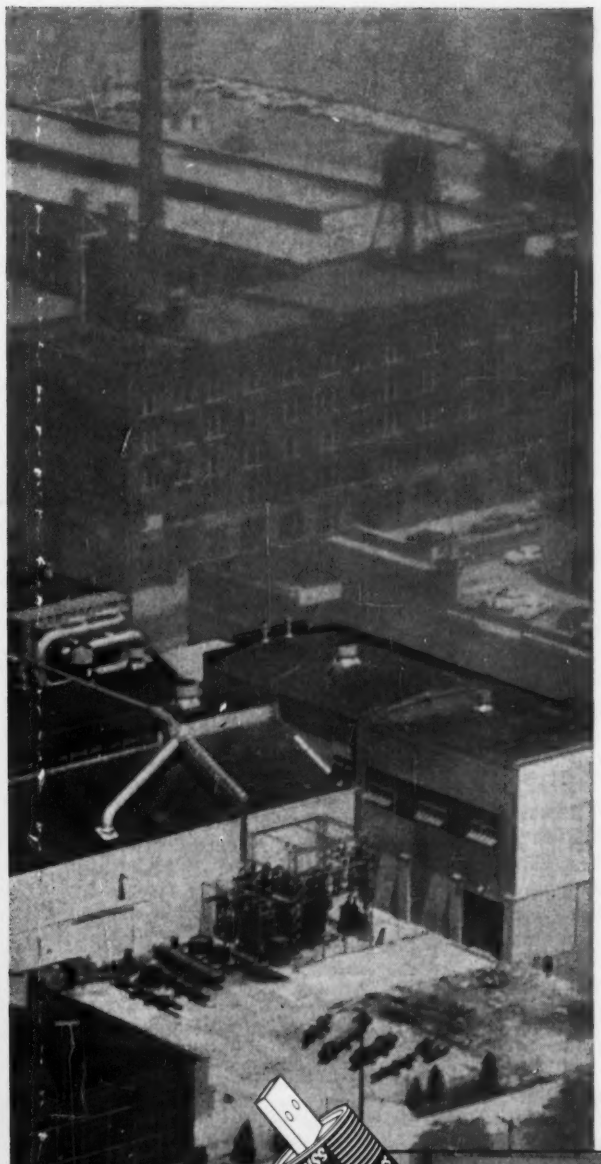
Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

CIRCLE 59 ON READER SERVICE CARD

Electrical Protection goes MODERN with BUSS Fuses . . .

at Sandusky Foundry & Machine Co.
Sandusky, Ohio



THIS ALL FUSE INSTALLATION PROVIDES NEEDED HIGH INTERRUPTING CAPACITY—AND SAVED AN ESTIMATED $20,000

A new electrical system was installed at the Sandusky Foundry and Machine Co., to feed a 1000 KVA annealing furnace and plant feeders and sub-feeders.

The engineers at Universal Marine Construction Co., Sandusky, Ohio who designed and installed the job, estimated the available fault current would be in the neighborhood of 75,000 amperes.

To be sure of obtaining the needed safe and dependable protection BUSS Hi-Cap and FUSETRON dual-element fuses were installed.

DEPENDABLE PROTECTION AT A $20,000 SAVING

Including the cost of fuses and switches, an estimated $20,000 was saved over what it would have cost to use mechanically operated devices with an interrupting rating of only 75,000 amperes.

This BUSS and FUSETRON fuse installation also permitted the electrical system to be co-ordinated, so outages on feeder and sub-feeder circuits can be limited to the circuit on which trouble occurs.

ELECTRICAL SYSTEM NOT DISTURBED WHEN TRANSFORMER CAPACITY WAS INCREASED

Shortly after the original installation, additional transformer capacity was added,—bringing the available fault current to approximately 150,000 amperes.

No change in the main service panels was needed, however, as the 200,000 amp. interrupting capacity of BUSS Hi-Cap fuses is still adequate to assure safe protection.

Neither was a change required in the protection of feeder circuits because FUSETRON fuses have adequate interrupting capacity to safely handle any fault that might occur on them.

SAFE PROTECTION REMAINS SAFE

After years of inactivity, BUSS Hi-Cap and FUSETRON fuses provide the same safe, accurate protection if called upon to open as they would on the day installed. Dust, fumes, corrosion or age cannot increase the capacity of fuses or lengthen their blowing time.

For more information on how to select the proper fuse, write for the new BUSS booklet . . . *Basic Protection for Electrical Power Systems.*

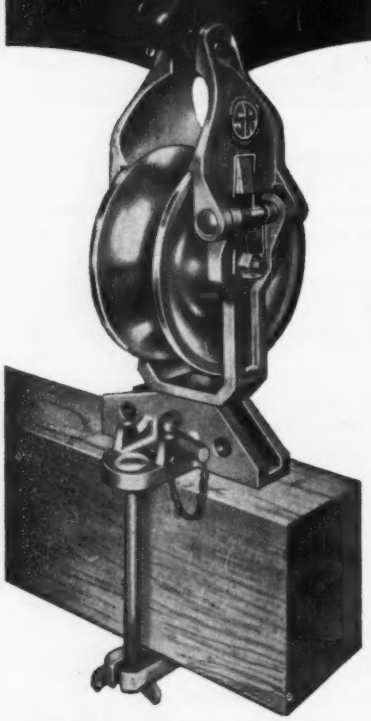
BUSSMANN MFG. DIVISION, *McGraw-Edison Co.,* **ST. LOUIS 7, MO.**

1261

BUSS Fuse
FUSETRON
6-1200 amp. switches with 1200, 800, and 650 amp. Buss Hi-Cap fuses.
1-3000 amp. switches with 3000 amp. Buss Hi-Cap fuses.
100, 200 and 400 amp. switches with FUSETRON dual-element fuses for feeder and sub-feeder protection.
KEEP PACE ELECTRICALLY
with Safety!

S&R Universal Stringing Sheave

MODEL XS-100



USE on CROSSARM as shown

USE on ANGLE for cornering block

USE without BRACKET to suspend from insulator stringing

Light weight, adjustable bracket, tough aluminum alloy throughout, safety locking, wide throat and anti-friction bearings. Grooved for cable through 1¾" diameter. Designed especially for ACSR.

NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY, INC.

ENGINEERS AND MANUFACTURERS

CHATTANOOGA 2, TENNESSEE

Telephone AMherst 7-1273

TWX CT-7036

Lighting Unit . . .

. . . operates automatically and instantly in an emergency, illuminating 10,000 to 25,000 sq ft continuously for 3 to 8 hr or more, depending upon number of lamps used. Model E Lightguard is a 100-amp-hr battery-powered unit which is designed for permanent connection to 115-v, 60-cps power. In event of blackout on a system, it instantaneously illuminates two 25-w sealed-beam lamps mounted on its case and up to three remotely-connected lamps to light adjacent areas. (With total of five lamps, Model E gives 3-hr protection for 25,000 sq ft or more.) Unit automatically recharges itself for the next emergency. Weighing about 100 lb, model is 18 in. high, 12 in. wide and protrudes from wall 13½ in.

Exide Div, Electric Storage Battery Co, Rising Sun & Adams Aves, Philadelphia 20, Pa. (10)

Polypropylene Rope

. . . has low electrical conductivity because it sheds water, is completely rot resistant. The Gladiator polypropylene rope is said to be ideal for hand pulls, pulling transmission cables, for block tackle. It is lightweight, yet reportedly 50% stronger than manila ropes. Even tension on all strands is said to be assured. The rope reportedly can be spliced in seconds.

Berkley & Co, Spirit Lake, Iowa (11)

(More New Equipment, p 64)

No more stopping to clear chips

New Irwin Pole-Bor Bits save time . . . money

Now get easier, faster, non-stop boring action in telephone and power poles. Irwin Pole-Bor bits give continuous chip flow—even in creosoted wood. Special Irwin cutting head, twist angle, and smooth-polished hollows eliminate clogging and binding. Side lip smooths hole for easier insertion of bolts and pins. Heat tempering full length gives extra strength, more safety for the man on the pole.

3 Lengths — 12 Sizes

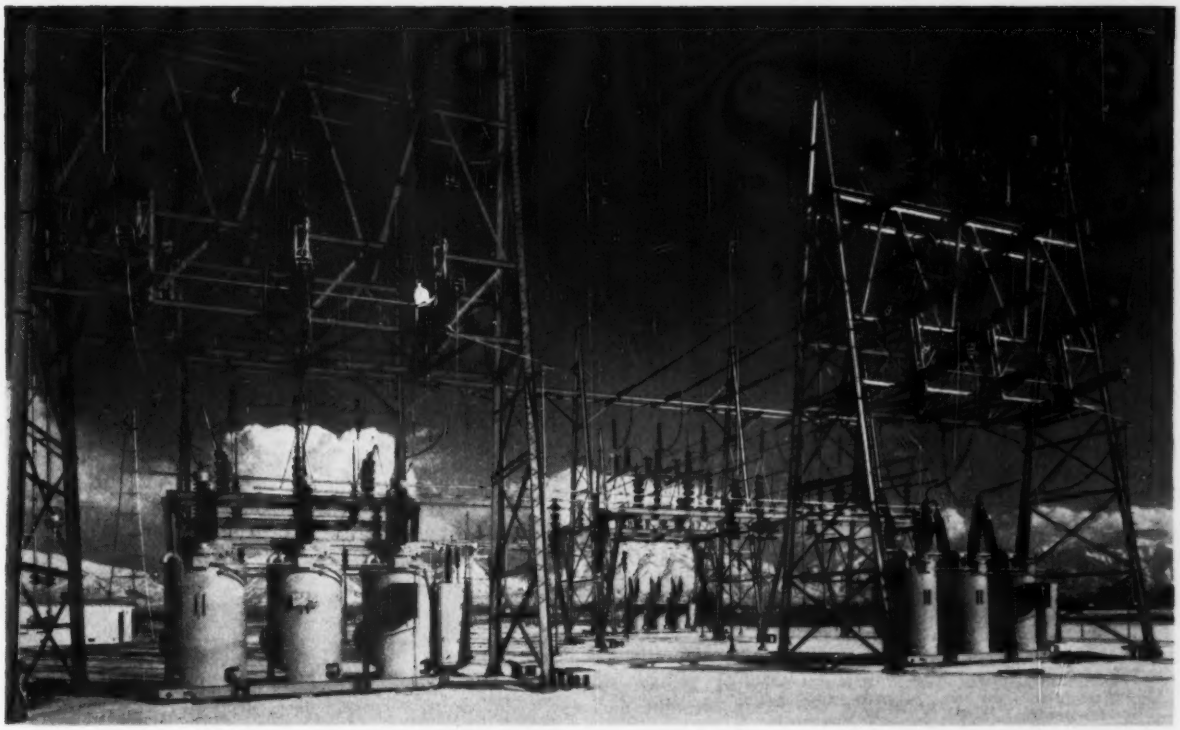
New Irwin Pole-Bor bits come in 12", 18" and 24" lengths, with 8", 12" and 18" twists. Sizes range from 6/16" to 17/16". Use these new Irwin bits for just about any job — whether boring crossarms, small, medium or extra large poles, heavy timbers. And remember: Irwin's patented Adapter Shank fits both hand braces and electric drills. Save time and money. Use fewer bits on the job. Get Irwin Pole-Bor non-stop boring action and extra safety, too. Order from your Irwin distributor today. The Irwin Auger Bit Company, Wilmington, Ohio.

Irwin Adapter Shank fits both hand braces and electric drills

Comes like this with taper square shank for use in hand braces.

Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

IRWIN Pole-Bor Bits



GOOD NEIGHBOR IN A BIG TERRITORY

Distances stretch far and mountains rise high in the territory served by the Utah Power & Light Company. The vision of the people stretches far and rises high also; and the people have a great capacity for progress. That is why the territory is growing.

New industries of many kinds are putting forth products. Mineral deposits are being brought into use. Modern agriculture and food processing are flourishing. And homes, homes, homes are going up.

Utah P & L is like the people it serves. Vision: it is one of 53 utilities building in the East a 40,000 kw prototype high temperature, gas-cooled reactor generating plant. It also is joining with 7 other Western utilities in a research program on thermoelectricity.

Progress: Utah P & L spends constantly to expand its facilities so more people can take more advantage of the territory's opportunities. Construction outlay in the past decade has been over $165 million.

Utah P & L enjoys a good neighbor relationship with its customers. For instance, farm and home customers pay an average of 2.11 cents per kw, 15% below the national average. Their average use is 4,470 kw per year, 17% above the national figure.

Utah P & L is a far-sighted good neighbor in its use of paint, too. It uses Subox paint for long-lived protection; and paints its substations with Subox aqua blue, a color as lively and pleasing as the territory the company serves.

SUBOX PAINTS

Subox Inc.
Trade Mark

Main Office & Plant: 3 FAIRMOUNT PARK, HACKENSACK, N. J. • SALES ENGINEERS IN MOST MAJOR CITIES

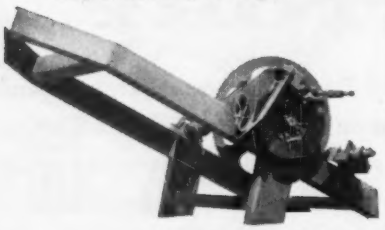
Affiliated Plants: Canada, Mexico, England, Belgium, Switzerland, Austria, Australia, New Zealand.

Now—Convert your own Reel Dolly to a Bullwheel Tensioner WITH A

PENGO 5000-U Assembly

5000-U assembly installed by City of Medicine Hat, Alberta, Canada

Here's an easy way to build up a modern bullwheel tensioner at low cost—simply install a PENGO 5000-U Bullwheel Assembly to your old trailer or reel dolly. You'll have a tensioner with Neoprene-lined 26" bullwheels, capable of handling practically any distribution line stringing job at tensions to 2,000 lbs. at up to 4 mph.



Support arms, reel spindle with reel brake, and hand rewind assembly. 2½" spindle will handle reels to 75" diameter, 44" width unless reduced to fit your trailer.

Bullwheel and tension brake assembly may be purchased separately.

We invite you to write or wire for literature, prices—please address Dept. 124.

PETERSEN ENGINEERING COMPANY, INC.

Santa Clara, California

Phone: AXminster 6-7712

16

Fiberglas Ladder . . .

. . . is non-conducting, precision balanced and designed expressly for use in electrical areas. The line of Fiberglas Safety Step ladders are made of heavy-duty Fiberglas rails and aluminum steps. For greater stability and safety in straight and extension units, the I-beam rails are combined with an exclusive safety Oval-Lok rung-to-rail connection which prevents aluminum rungs from turning, pulling out or collapsing. Ladders meet or exceed requirements of the Metal Ladder ASA Code. All are equipped with safety rubber feet.

Louisville Ladder Co, 1101 W Oak St, Louisville, Ky. (12)

Plant Cleaner . . .

. . . is adaptable to any standard 55-gal drum for wet or dry pickup. Power-Vac Model 765 can be used with Hild vacuum tanks and tools to form nine different models for heavy-duty service; tank models from 6 to 55-gal capacity adapt to 1½, 2, or 3-in. hose and tools. Its two 1½-hp motors reportedly develop maximum air volume. Unit can be operated with a single motor when twin power is not needed, or with both motors to power separate cleaners. It is detachable for use as a portable blower or a back-mounted vacuum cleaner.

Hild Floor Machine Co, Inc, 1217 W Washington Blvd, Chicago 7, Ill. (13)

call Graybar for rugged Hubbard fiber glass strain insulators

Strong, light, unmatched insulators—that's Hubbard Strain Insulators of non-deteriorating fiber glass. They need no arcing horns, meaning shorter guys, less interference with other components, lower installed cost. They're uniform, too: each is tested to 30,000 lbs. before shipment. Get Fiber Glass Strain Insulators, and other Hubbard hardware, promptly from Graybar stocks. It's another reason to call Graybar - for everything. Graybar Electric Company, Inc.: local service to utilities through coast-to-coast warehousing.

GraybaR

855

NATVAR TUBING AND SLEEVING

For a Wide Range of Military Electronic and Electrical Uses.

General Purpose Extruded Vinyl Tubing	
Natvar 241	MIL-I-631C, Type F, Form U, Grade A, Class II, Category 1.
Natvar 261	MIL-I-631C, Type F, Form U, Grade A, Class I & II, Category 1.
Low Temperature Extruded Vinyl Tubing	
Natvar 361	MIL-I-631C, Type F, Form U, Grade B, Class I & II, Category 1.
Natvar 362	MIL-I-7444B, Type I, II & III, Range I, II & III.
Natvar 363	MIL-I-22076.
High Temperature Extruded Vinyl Tubing	
Natvar 461	MIL-I-631C, Type F, Form U, Grade C, Class I & II, Category 1. U/L Approved for 105°C Continuous Operation.
Natvar 400	U/L Approved for 105°C Continuous Operation.
Natvar 500	Specially Formulated for Use in Transformer Oil.
Natvar Coated Fiberglas Sleevings	
Vinyl	MIL-I-21557 (Grade A Only) and MIL-I-3190B.
Isolastane (Polyurethane)	MIL-I-3190B.
Silicone Rubber	MIL-I-18057A (Grade A Only).

Natvar

Natvar Products

- Varnished cambric—sheet and tape
- Varnished canvas and duck—sheet and tape
- Varnished silk and special rayon—sheet and tape
- Varnished papers—rope and kraft—sheet and tape
- Varnished, silicone varnished and silicone rubber coated Fiberglas*—sheet and tape
- Slot cell combinations, Aboglas®
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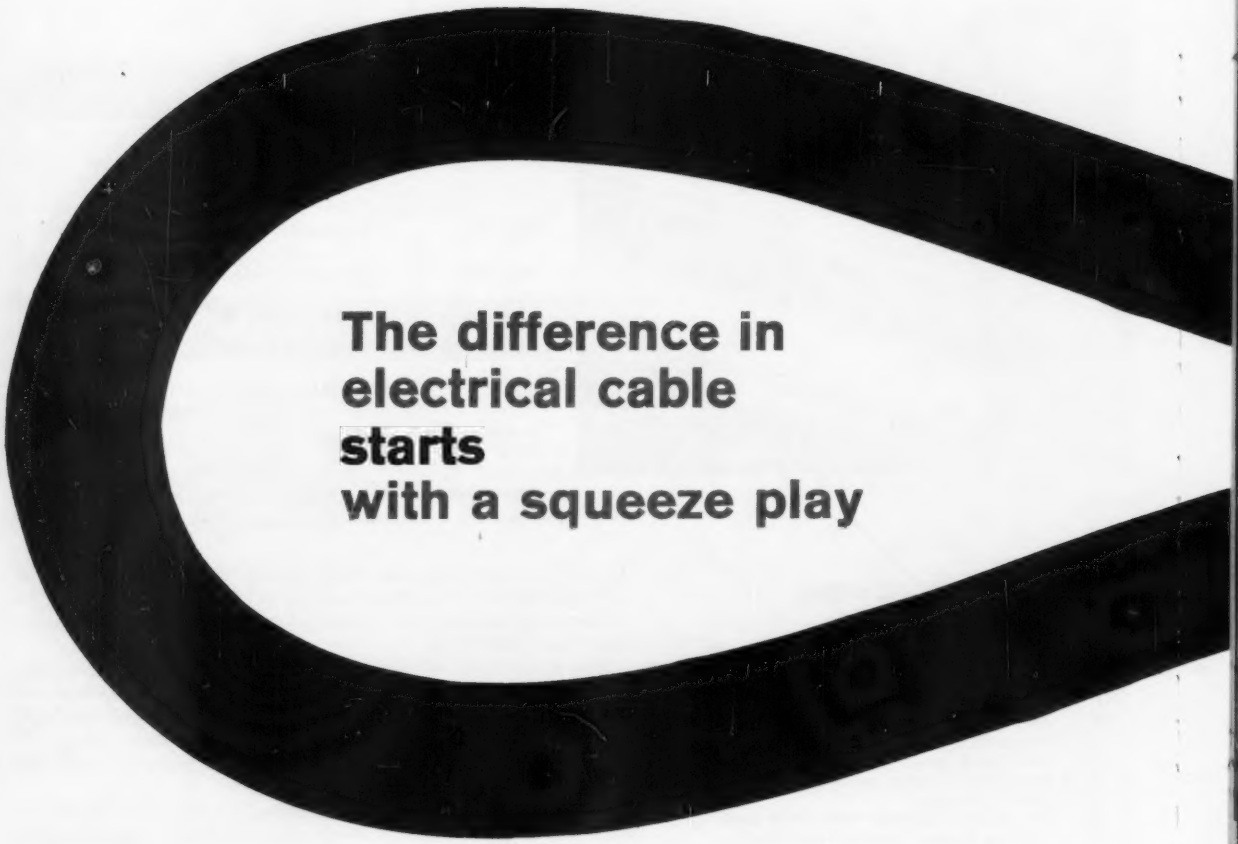

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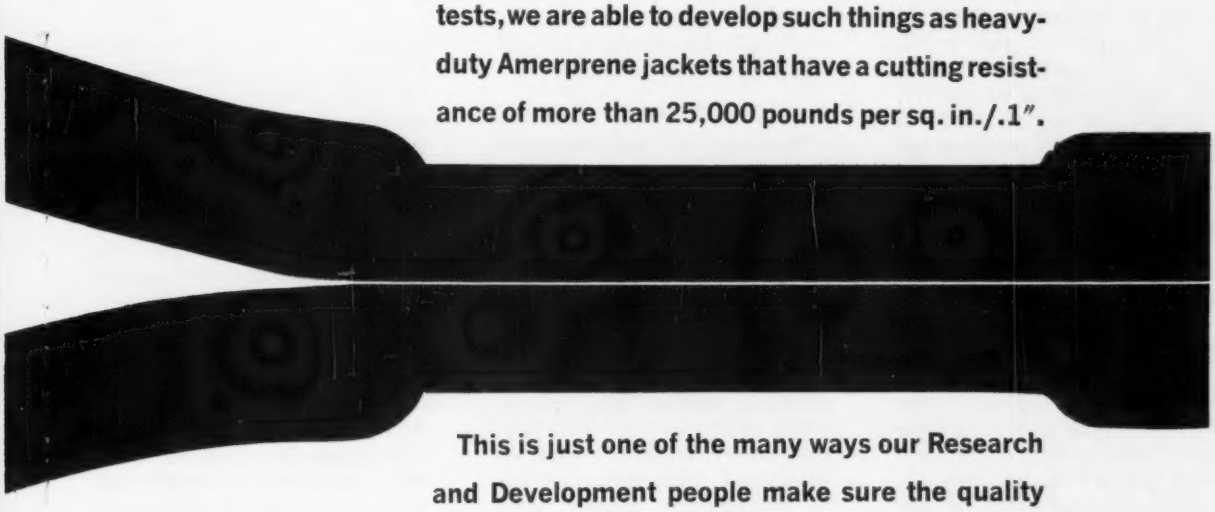

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ELECTRIC UTILITY METHODS

FEATURE SECTION

FIG 1—**BARRIER SHIELD** keeps conductors 8 in. away from bucket. Shield is supported by wooden dowels on bucket

Energized Distribution

C. P. ZIMMERMAN, Chief Engineer
H. L. RORDEN, High Voltage Practices Engineer, American Electric Power Service Corporation, New York City, N. Y.

Development of the barehand method for working on energized lines, (December 19, 1960 p 76), initially was performed principally on intermediate voltage systems (34-138 kv) in order to derive safe working practices and to gain confidence in the basic concept. Once this confidence was established, efforts were directed toward methods of utilizing this technique at all transmission and distribution voltages.

Probably the most lucrative field in which to reap benefits of time and cost savings from application of barehand work is on distribution systems because there are so many more miles of these lower voltage lines and they are commonly located where they are accessible to mobile repair equipment. Comparison of some common types of repair on distribution lines ranges from ⅓ to 1/50 of the man-hours required by the barehand method, compared with former practice. The barehand method is especially advantageous from the standpoint of safety, time to do the job, and maintenance of service for replacing splices and installing sleeves on energized conductors away from poles.

The average ratio of man-hours by the barehand method compared to former practice is about 1 to 10 for conductor repair and about 1 to 4 for insulator replacement. The man-hours required for fifty typical jobs, including travel time, were recorded for the barehand method, and were compared with the conventional former practice. From this ratio, the estimated annual productive worth for barehand work is $48,000 for one unit, or 160% of the $30,000 purchase price of this large custom aerial lift.

'Barehand' Minimizes Outages

Working by the barehand method on distribution system, both in stations and on lines, is relatively simple because it is often easy and fast to temporarily move conductors that may restrict clearances, or to cover them. The particular advantages of the barehand method are: that work can be done from a more favorable position using conventional hand tools, the truck motive power is available to perform work, and conductors need not be lowered nor removed from service to work on them. There are instances where, in former practice, it was necessary to set temporary poles to maintain traffic clearances while making repairs. Workmen must maintain the same clearances to energized equipment to which they are in close proximity for any method of working—neither gloves nor hot sticks reduce that necessity.

The first barehand work undertaken on the American Electric Power system in the summer of 1960 consisted of replacing insulators on a 34-kv distribution line. By February, 1961 crews began working barehanded on 12-kv distribution lines as part of their daily routine. During the first six months of 1961, a line crew made daily barehand repairs, many of which had been deferred because outages formerly were required. Of these repairs, 80% were on distribution systems, 25% of which was on 12 kv, 40% on 23 kv, and the remainder on 34-kv systems. This included work to (1) replace automatic sleeves, (2) replace sections of conductor, (3) replace temporary taps with permanent compression joints, (4) replace pin, suspension and dead-end insulators, (5) by-pass and replace station disconnects, (6) replace crossarm, (7) replace pole, (8) relocate three spans at a T junction, (9) install preformed line splices, (10) energize new section of station, (11) extend station bus, (12) replace dead-end loop, (13) on double circuit line, replace three suspension and three post-type insulators and three cross-arms, (14) repair burned switch blade, (15) install vertical connection between horizontal overhead buses, and (16) transfer line to new pole. Formerly, about 70% of this work would have required removal of lines or stations from service. To devise methods for performing this work by a new and different technique might well discourage the more timid.

It would be foolhardy to consider having two workmen work on different phases or circuits simultaneously from an aerial lift—whether it is a single or twin bucket type. In our practice both bucket screens of the twin-bucket type are always electrically connected together, so that they are

FIG 2—**HYDRAULIC RAM** and two comealongs take tension on 12-kv line while current is by-passed with jumper

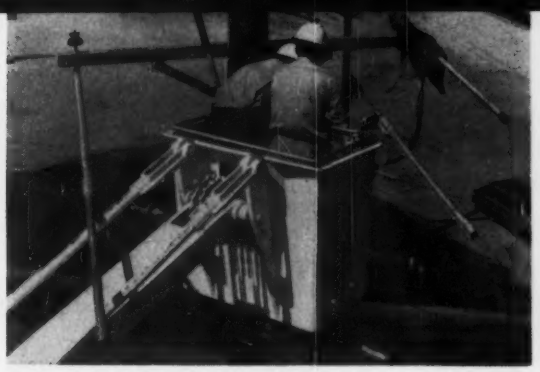


FIG 3—**AT 12-KV T JUNCTION,** a new tap connection is made barehand while the original line is still in service

Lines Now Worked 'Barehanded'

essentially a single support for the workmen, and always must be at the same potential. Workmen are not permitted to work simultaneously on any equipment that is associated with different insulators mounted on the same crossarm.

Fiberglas lift buckets usually have enough dielectric strength when new to withstand the lower distribution line-to-line voltages, but until experience indicates that these buckets are not vulnerable to deterioration from age or other damage, no dependence is placed on their puncture strength. They are considered as barriers, and adequate distance is maintained between bucket walls and floor to everything that is at a different potential from the screen lining. Materials are available but have not yet been approved in this application, since it is easy to maintain an adequate air gap. Undoubtedly, reliable bucket or insert liner insulation can be very useful in some types of barehand work.

An effective method we have found for obtaining clearance from the bucket to nearby conductors is to provide a shield with insulating spacers, and covering front, sides and bottom of the bucket, Fig. 1. This shield keeps conductors 8 in. away from the bucket; a distance adequate for all line-to-line distribution voltages and also line-to-ground subtransmission voltages up to 69 kv. The shield is supported by two wood dowl sticks resting on the bucket, and is easily and quickly installed or removed. A similar type of guard in the form of ribs has been devised to prevent metal booms from contacting energized conductors. (For convenient designation in this article, the upper insulated boom of articulated lifts is called the arm, the lower boom is called the boom.)

Workmen Are Enthusiastic

Although groundmen, foremen, and trainees usually have been present during the development stage of working barehanded, many types of work, such as repairing splices, and replacing insulators, are performed by the two men in the aerial lift without additional assistance. Tools are carried aloft in the bucket, but workmen can lower themselves to the ground for tools and equipment, if necessary, and return in a very short time to the work area. Some types of work, such as replacing poles, require additional crews and equipment.

On distribution lines in particular, some early-type splices that are giving trouble are being replaced as routine procedure with compression sleeves. In Fig. 2 a hydraulic ram with extension arm and two comealongs are taking the tension of a 12-kv distribution line while load current is carried in a by-pass jumper. The splice is replaced as easily and safely from the aerial lift in a fraction of the time and with the line energized as formerly it was worked from the ground with the line out of service. The same ram assembly is used to replace dead-end suspension strings.

Workmen are generally enthusiastic about learning to work barehanded and to suggest how different jobs might be done. Thus far, very little work has been found for which a preference for conventional practice has been expressed. Where such instances arise, the same crews, working from poles or from aerial lifts use gloves, sticks, or the barehand method wherever they choose on the same job. Men never work singly from aerial lifts, and experienced linemen find no unusual risks in using different methods alternately. They consider that the risks that are eliminated are more serious than those which occur with the barehand method.

In a recent relocation of several poles of a 12-kv line at a T junction, the cut-over was accomplished by the barehand method without an interruption to service. In Fig 3, the new connection is being made at the junction while the original line is still in service. The tap has been completed on the outer conductor to the right in the picture, and it was then covered as a precaution. The bucket was then maneuvered upward between the remaining two conductors, and the outer one on the left was covered while the tap was installed on the middle one. The bucket was then maneuvered outside the outer conductor and the final tap was made from this position.

At the other end of the relocation, Fig 4 there was a small angle between the new and the original line. The cut-over consisted of first connecting new and old conductors with a jumper,

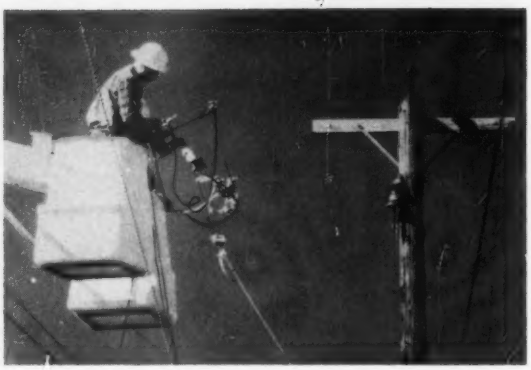


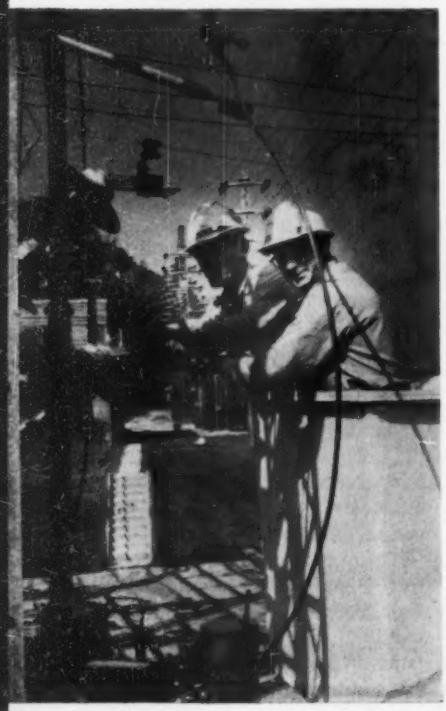
FIG 4—FOR RELOCATING POLE having small angle between new and original line, the aerial lift was first shifted to install jumper, then moved for splicing

FIG 5—RIDGE PIN INSULATOR is replaced by supporting conductor on an auxiliary arm. Motive power of arm, which moves vertically and laterally, lifts heavy parts

then cutting the original conductors at midspan, and splicing to the new ones with compression sleeves. The aerial lift was first maneuvered to position the bucket in line with the original conductors to install the jumper and then the bucket was moved laterally into position for the new span and proper sag for splicing.

Barehand replacement of the outside pin or post insulators on a distribution crossarm as a relatively simple operation, and was the first work ever attempted by the barehand method. An auxiliary insulating arm of the lift can be used to good advantage for replacing ridge pole or crossarm-mounted middle insulators although there are other workable methods. In Fig. 5 the outer conductor of a 12 kv distribution line has been suspended out of the way on a link stick, the twin buckets moved astride the crossarm, and the tie wire of the middle conductor cut by the barehand method. The conductor was then supported on the insulated auxiliary arm before disconnecting from the conductor and removing the insulator. The auxiliary arm can be rotated vertically as well as extended laterally, so that the conductor can be lifted by motive power where it is hard to reach or heavy to lift.

FIG 6—SWITCH BLADE is removed from isolated 12-kv disconnect



In Fig. 6 a 12-kv station disconnect switch has been by-passed and isolated for repair. The conductor and by-pass jumper are supported out of the way on insulating link sticks lashed to the steel structure. The switch blade is being removed without interruption to service, as easily and safely as though the men were standing on the ground and the circuit was de-energized. Design of tools for permanent use in performing this and similar types of work result from such planned development.

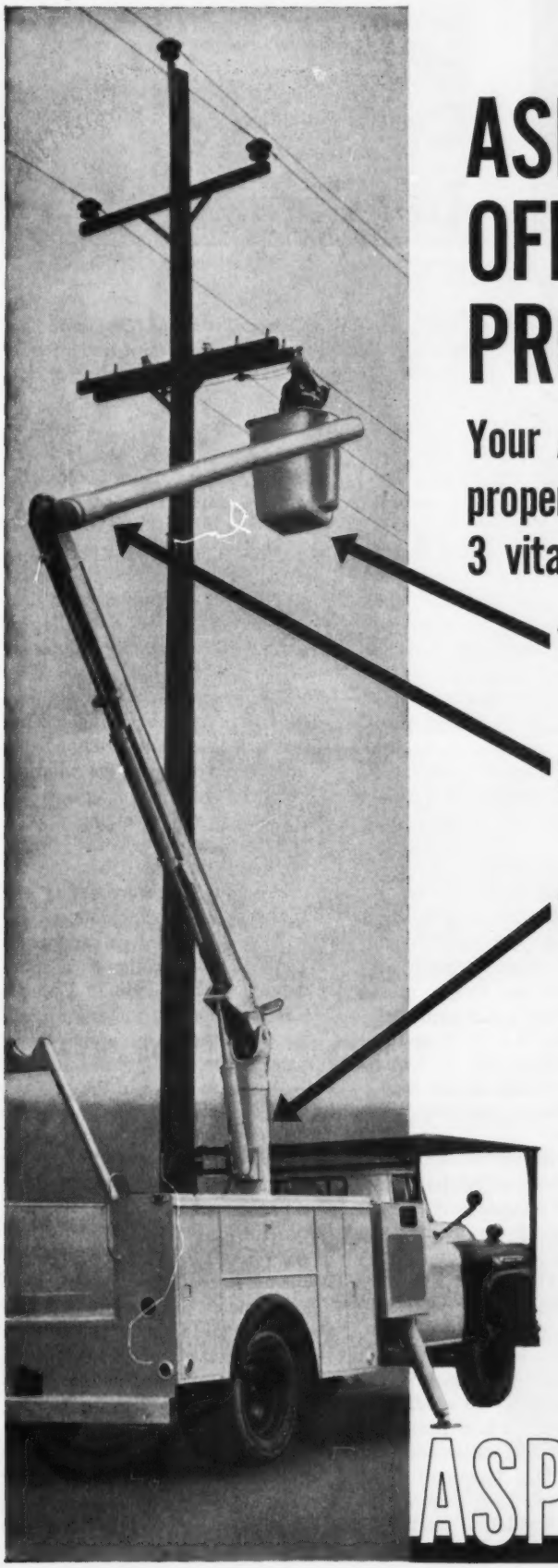
Truck Position is Important

Position of the aerial lift for maximum maneuverability and versatility while working can materially affect the ease of doing a job. Training requires study of truck positioning in order to provide easy access to congested areas on poles—many of which cannot be worked from the poles with the lines energized.

The weight of insulators and one span of conductor of distribution lines usually can be carried on buckets or on an auxiliary arm of aerial lifts, in addition to the workmen. By properly positioning the trucks so that the upper arm is at a steep angle, articulated booms are relatively stable and can lift more load than when the upper arm is horizontal. This feature makes lifts useful for replacing insulators, both for safety and in time required to complete the job. In particular, it is possible by this means for some lifting to be done by the mechanized power drive, and thus ease the lineman's burden, as well as to eliminate the necessity for some conventional lift sticks.

The few examples of the many methods that have been devised for working barehanded within the first year since its concept, signifies the potential possibilities that are still to be investigated. We are at times surprised at the work simplification that already has resulted from the ingenuity, cooperation, and experience of maintenance staffs of AEP Companies in applying this method.

CIRCLE 25 ON READER SERVICE CARD



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Speed Field Tests On Power Transformers

TRANSISTORIZED CURRENT REGULATOR inserted between 12-v dc source and Kelvin bridge permits more accurate field test results in a shorter period of time

H. B. CUMMINGS III, Electrical Laboratory and Test Branch, Tennessee Valley Authority, Chattanooga, Tenn.

Time required to test power transformers has been decreased appreciably by Tennessee Valley Authority by using an automotive 12-v battery, the output of which is controlled by a current regulator for use with a Kelvin bridge.

Since the size of power transformers has increased, testing them to locate trouble or detect weaknesses has become more difficult and time-consuming and also more important.

For transformer tests, the practice of the TVA has been to include use of a Kelvin bridge to measure the direct-current winding resistance. A current source of several amperes must be used with the bridge to give adequate galvanometer sensitivity. TVA has resorted to the almost exclusive use of automobile storage batteries because of their relatively high capacity and convenience. One cell of an automobile battery will provide approximately 2 v.

On an unknown resistance of high inductance, such as the 161-kv winding of a large transformer, two factors make accurate test readings time-consuming and hard to obtain:

- A considerable length of time, often up to 10 to 15 min, is required for the current to increase to its steady state value.
- Any variation in supply current causes the bridge to be thrown off balance because of induced voltage in the winding.

These factors can be partially overcome by using more current in the bridge test circuit, which decreases the inductance of the winding somewhat because of saturation effects. However, the use of higher currents to speed up the testing can result in damage to the Kelvin bridge.

To allow faster and more accurate reading of the bridge without resorting to high, damaging currents, a transistorized current regulator was constructed for insertion between the battery and the bridge. The regulator uses a 12-v dc source and provides currents which are variable in four steps, from 0.8 to 6.8 amp. These currents roughly match the maximum current rating of the bridge on the ranges most used. A 2-v step is also provided, which supplies 2.3 v at an internal resistance of 3 ohms for using the bridge on the high-resistance ranges requiring less than 0.8 amp.

To make Kelvin bridge tests on a transformer, using the regulator, the test engineer drives his car close enough to the transformer to make connections to its battery. The entire terminal voltage of the battery is used, making it unnecessary to get the voltage from a single cell.

The regulator increases both speed and accuracy of readings:

- Approximately 11 v is available to speed the initial current buildup. Voltage tapers to 5 v just before selected current is reached and regulation started.
- After the current has built up to approximately the selected value, the regulator holds the current essentially constant in spite of the inductance of the winding and the fluctuation of battery voltage or lead resistance.

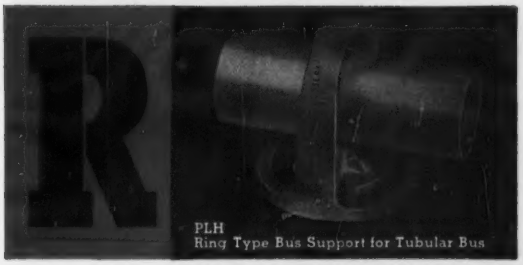
The ultimate reduction in time required to make a reading is limited by an inherent time lag between the application of a steady state current and the time the magnetization of the core becomes stable. The changing flux induces a voltage in the winding, even though the current in the winding is not changing.

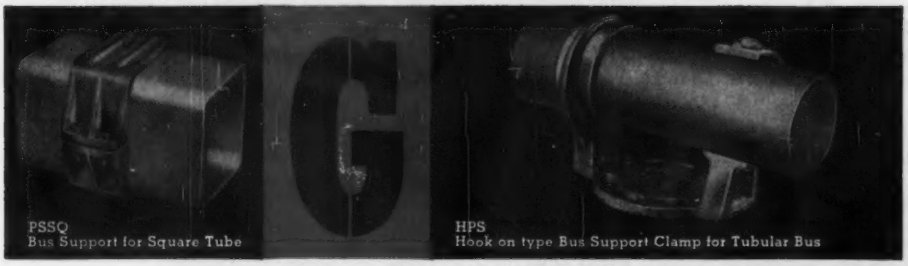
The accuracy of the bridge reading is increased because the effects of battery-voltage and lead-resistance fluctuation are reduced. The galvanometer, therefore, will come to a more definite, stable reading. There is less possibility of making a reading when the bridge is improperly balanced due to induced voltage.

A silicon diode in the test circuit enables the transformer to discharge when the battery is disconnected with current in the transformer winding. Another diode, in series with the battery, protects the transistors in case the battery polarity is accidentally reversed.

A meter indicates the output current, or actually the voltage across the series reference resistance, to show that the equipment is operating properly.

An "overcharge" button permits the operator to increase the current to slightly more than the selected value. When the button is released, the current drops to the selected value.





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Airborne Noise Is Reduced 14 Db At Hungry Horse

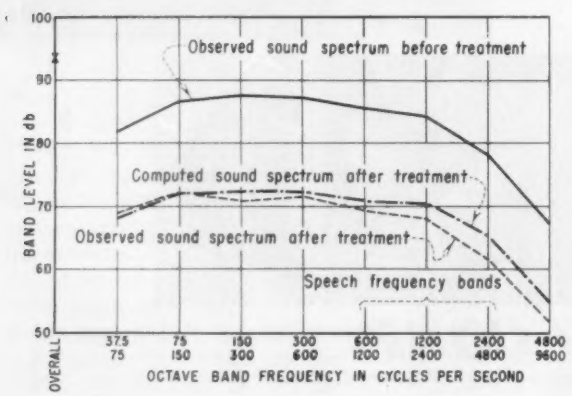
JOHN PARMAKIAN, Chief, Technical Engineering, Analysis Branch, U. S. Bureau of Reclamation, Denver, Colo.

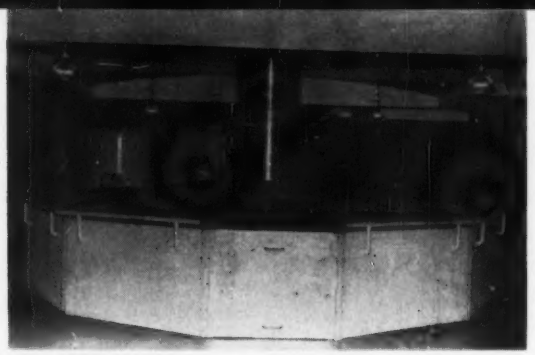
By installing enclosures over the turbine pits and applying acoustical absorption materials on the walls and ceiling of the turbine gallery of Bureau of Reclamation's Hungry Horse Powerplant, the airborne noise level in the gallery was reduced about 14 db throughout all frequency ranges. This effectively solved a noise problem so objectionable that even a face-to-face conversation was difficult.

Measurements, taken in the vicinity of the operator's desk in the turbine gallery, indicated that an airborne sound level of about 87 db existed before the acoustical treatment was applied. This figure approaches estimates of the maximum sound level that can be tolerated for a given period of time without risk of damage to the ear and some degree of permanent hearing loss. Some form of ear protection or noise reduction is considered mandatory when the noise level is about 95 db in any octave band for full-time exposure of each working day.

The Hungry Horse Dam and Powerplant, completed by the Bureau of Reclamation in 1953, is located on the South Fork of the Flathead River, about nine miles southeast of Columbia Falls, Mont. The powerplant contains four generating units, each 71,250 kw. The hydraulic turbines are rated at 105,000 hp and operate at a speed of 180 rpm. The rated head on the turbines is 400 ft but the units operate over a head range of 259 to 484 ft.

The general arrangement of the turbine gallery is such that the operator's desk in the gallery is located between the open turbine pits. The gallery is a low-level, arched room 240 ft long by 26 ft wide with a height to the top of the arched ceiling of 10 ft. The walls, floor, and ceiling are concrete. Four





ACOUSTICAL TREATMENT of turbine pit cover and gallery cut noise level at operator's desk to 73 db

20-ft-dia turbine and generator pits open directly into the gallery. Hence, any noise originating at the top of the hydraulic turbines or bottom of the generators is transmitted directly into the gallery.

The noisiest operation occurs when the head on the turbine is near maximum and when the turbine-wicket gates are at about the 0.4 open position. Very loud intermittent pounding noises are produced under the turbine head cover and these noises are transmitted directly into the turbine gallery. A slight reduction in this noise results when compressed air is supplied to the turbine.

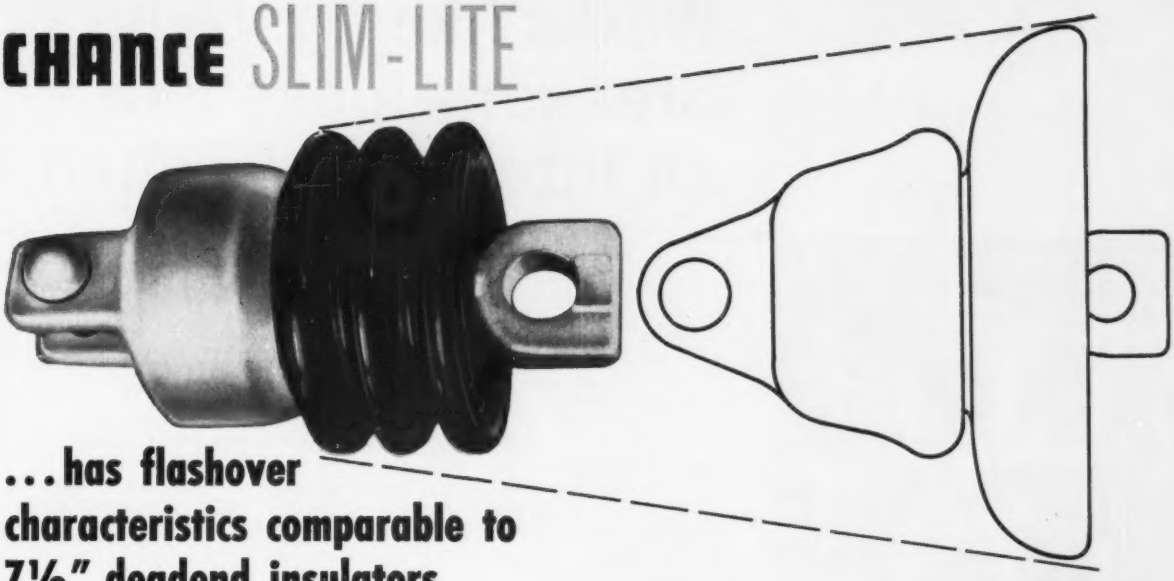
The noise transmitted from the bottom of each generator is essentially constant, regardless of the power output of the unit, and appears to be due primarily to noise of the circulating air which passes through the generator coolers. Thus, the more or less constant air-circulation noises at the generator and the variable turbine noises are the primary sources of noise in the highly reverberant turbine gallery.

It was first attempted to reduce the turbine noise before it had a chance to spread out into the turbine gallery. To accomplish this, special insulated steel and aluminum covers were installed over the turbine pits. These covers produced a 30-db reduction in the transmitted noise from the turbines. However, the noise from the bottom of the generators retained almost the same intensity at the operator's desk.

The specified acoustical treatment for the walls of the turbine gallery consisted of perforated asbestos-cement boards, mounted on 2- by 4-in. furring with a 1-in.-thick glass insulation board on the concrete wall between the furring strips. Treatment of the ceiling consisted of a suspended ceiling of ¾-in. fibrous glass boards, mechanically mounted on metal supports with 2-in.-thick fibrous glass batts laid on top of the ceiling boards. The suspended ceiling also provided a substantial air space behind the glass batts, which improved the low frequency absorption of the material.

This proved to be an effective solution to the noise problem in the turbine gallery, but there are no fixed or standard solutions to noise problems in hydroelectric powerplants. Acoustical absorption materials and even enclosures around noise sources have an important place in noise reduction; however, it will usually be found more effective and economical to recognize the potential noise sources in the plant in the early design stages and to arrange the plant and location of various facilities to minimize the effects of the noise.

CHANCE SLIM-LITE



...has flashover characteristics comparable to 7½" deadend insulators

Here are the reasons why the new Chance Slim-Lite deadend insulator has already been adopted by several utilities since its introduction last fall. A major reason is the design that gives this 4¼" insulator flashover characteristics comparable to standard 7½" insulators that cost 50% more. Puncture voltage rating is 20% higher than 7½" discs.

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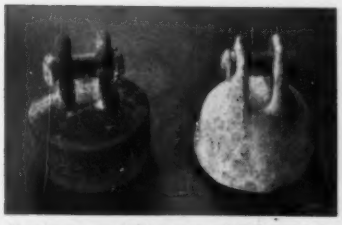

Aluminum cap (left) compared to ferrous cap (right) exposed to 500 hour salt fog test. Left...little effect. Right...badly corroded.

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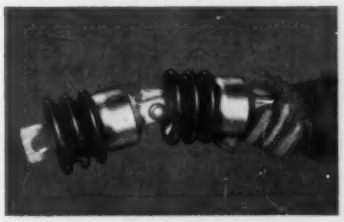

ALUMINUM DISSIPATES HEAT . . . reduces porcelain damage

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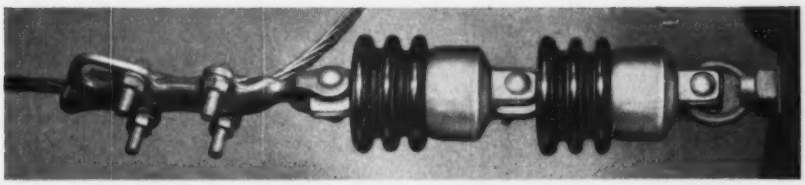
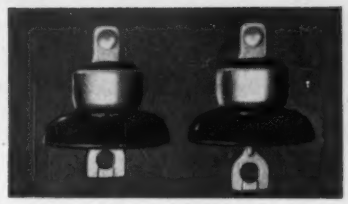


NEAT STREAMLINED APPEARANCE . . . easier to cover or work hot

New subdivisions demand attractive appearance, and maintenance crews like construction that is easy to work. The Slim-Lite is compact...easy to cover...easy to work hot. Its compactness simplifies three-wire aerial terminations.



ALUMINUM ALLOY HARDWARE is also available with long or short stud on Chance 6" ball type deadend insulators.

ABC INDUSTRIES

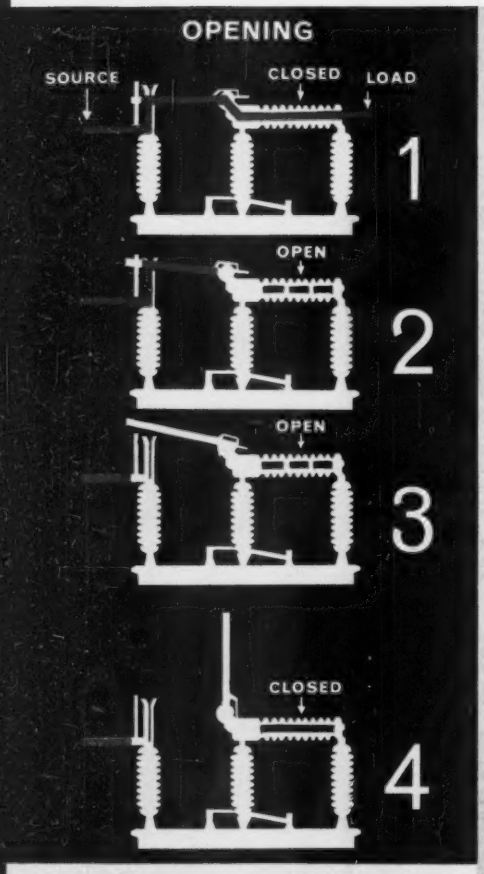
A. B. CHANCE CO.

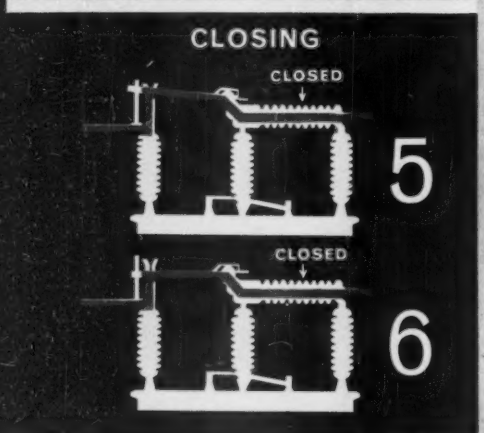
Centralia, Missouri

A. B. Chance Co. of Canada, Ltd., Toronto

C161-10

Works like a circuit breaker—looks like an interrupter switch





This is Circuit-Switcher. Costs less than a circuit breaker. Outperforms an interrupter switch.

Circuit-Switcher is the generic name for a new family of switchgear for handling a number of circuit interrupting duties on transmission systems. It's a cross between an interrupter switch and a circuit breaker. A significant feature of Circuit-Switcher is that it is mechanically programmed to fit high-voltage switching environments, whether breaking or making the circuit.

PROGRAMMED CIRCUIT BREAKING

1. When Circuit-Switcher is in the closed position, the interrupting section carries the continuous current and withstands short-time surges—like a breaker.
2. As Circuit-Switcher starts to open, the "brain" mechanism (with its built-in sequence control and stored energy) trips the interrupting section, opening the circuit—like a breaker.
3. Now the "brain" moves the disconnect blade toward the open position to establish a visible air gap—like an interrupter switch. But unlike an interrupter switch, the blade is not burdened with shunting, actuating, and driving an interrupting unit.
4. As the disconnect blade approaches the fully open position, the "brain" recloses and recocks the interrupting section, unlike the interrupter switch which must recock at the most adverse loading point in its closing cycle.

PROGRAMMED CIRCUIT MAKING

5. As "brain" closes the blade, inrush current (or fault current) is picked up at the jaw . . . not in interrupting section. Unlike the interrupter switch, the blade closes at high speed, unimpeded by having to reclose and recock an interrupting unit.
6. Circuit-Switcher is completely closed—ready for the next opening cycle.

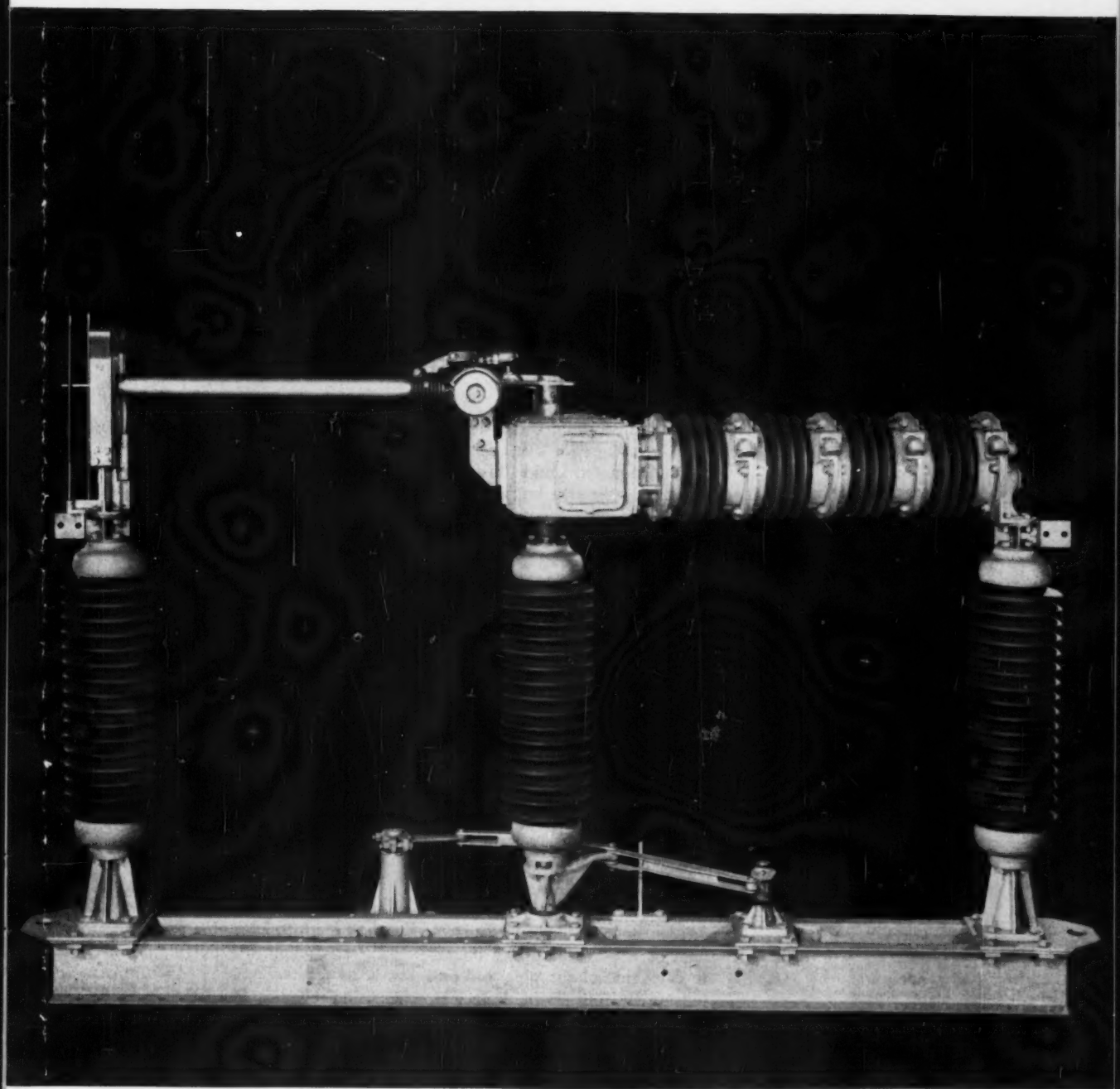
With the guts to do the job

Like a circuit breaker, Circuit-Switcher's vital close and trip mechanisms are fully enclosed and protected. Unlike an interrupter switch, there is no gingerbread—no external shunts, triggers, cams, and levers—to freeze up, burn up, jam up, or goof up.

Operation is "Goof-Proof"

The correlation of interrupting section action, disconnect blade action, and operating handle action is pre-scheduled by the "brain" mechanism. Any operating procedure—such as reversing direction in "midstream"—will not result in improper sequencing of interrupting section and disconnect blade.

S&C ELECTRIC COMPANY
4421 Ravenswood Ave. • Chicago 40, Illinois
Specialists in High Voltage Circuit Interruption since 1911



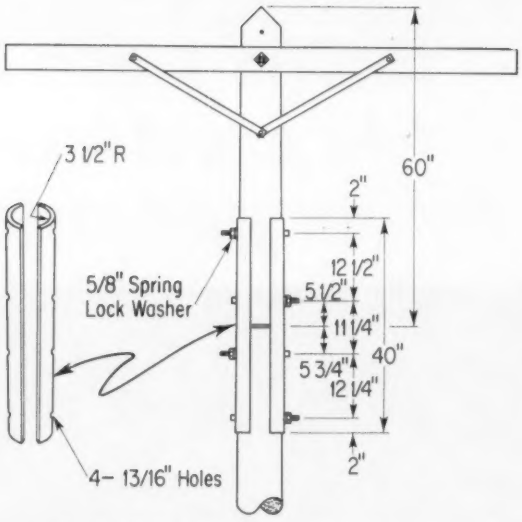
CIRCLE 77 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

E u m

CONSTRUCTION

Extensions Look Good, Save Pole Changeout



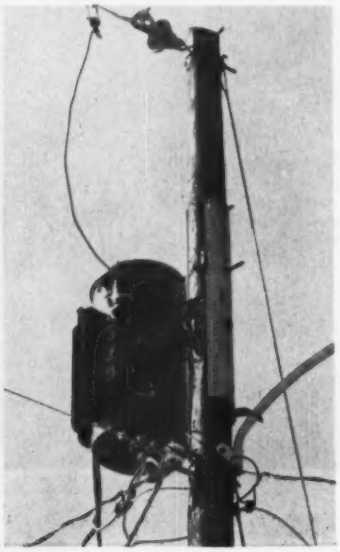
5-FT EXTENSION is bolted to pole with curved plates

J. H. CHEATWOOD, Distribution Dept, Duke Power Co, Charlotte, N. C.

To eliminate the expense of replacing sound poles, Duke Power Co has developed a pole-top extension which uses a 5-ft cylindrical section of wood with two curved steel plates to form the splice. This method effectively overcomes objections to pole-top extensions due to poor appearance or lack of strength.

Pole-top extensions are used on service poles and on secondary and primary straight-line poles. They are used on single-phase primaries in connection with the pole-top pin-type construction and on 3-phase primaries with crossarm-type construction. Some of the uses are to provide space for:

- An additional circuit
- Capacitor or recloser
- A transformer, which up to and including 25 kva, can be quarter-mounted and installed on existing through bolts
- Added equipment on properly guyed primary, secondary and service deadend poles
- Additional equipment on straight-line joint poles



EXTENSION provides space for transformer and secondary circuit

The economies of the pole-top extension thus far on the Duke Power Co system indicate an average saving of approximately $100 per installation.

The pole-top extension, used only on sound poles, consists of a new 5-ft section of creosoted southern yellow pine, treated to specifications, and framed for fast and easy installation. The top of the existing pole is sawed off level and the new 5-ft extension is set on it. Two 40 x 7½ x ¼-in. rolled steel plates bent on a 3-in. radius are bolted to each side of the pole and extension by four ⅝-in. bolts.

Treating the top of the existing pole with a preservation before the extension is installed is not necessary, because the newly treated 5-ft extension provides the necessary preservation to saturate the top of the pole.

The butt of a pole-top extension is selected to match as nearly as possible the top circumference of the pole which is to be extended. It is necessary to have a broad supply of extensions. Those with butt circumferences of 20-24 in. are being used now. Particular care is taken to saw off portion of an existing pole top that has "sweep," knots or other defects. A level square cut is made on the existing pole to assure a first class extension.

Since the 5-ft extension increases the lever arm when installed on an existing pole without increasing the groundline circumference of the pole, a reduction of approximately one pole class is effected. The ASA breaking load of a Class 5 pole is 1,900 lb. A 35-ft Class 5 pole set 6 ft in the ground with a horizontal force applied 2 ft from its top has a lever arm of 27 ft. The same pole extended 5 ft has a lever arm of 32 ft with a breaking load of 1,600 lb.

Extensive field tests, made to determine mechanical strength and performance, included tests to destruction by applying a horizontal force 2 ft from the top of extensions installed on good used poles. Class 5 poles, having an ASA breaking load rating of 1,900 lb at the groundline, were used in these tests. The poles failed at or near the ground line at a test load of 2,250 lb. The spliced portions of the poles did not show any evidence of failure or weakness.

WHY LINEMEN RELY ON KLEIN CLIMBERS

There is no piece of equipment more important to a lineman's safety than his climber. Klein pioneered in the development of the climber back when the first wires were strung, and today Klein climbers are preferred because of their safety design, built-in comfort and wide range of styles to suit every preference.

Whether it is a replaceable gaff, adjustable climber or fixed length climber . . . with riveted ankle loop or triangular ring . . . you will find it listed in the Klein Catalog. For convenience, all adjustable climbers may be obtained complete with straps and pads.

Klein adjustable climbers may be had with replaceable gaff—matched pairs, right and left.
1958-AR with riveted ankle loop.
C-1958-AR as above, complete with straps and pads.
1959-AR with triangular ankle ring.
C-1959-AR as above, complete with straps and pads.

Adjustable "Pole Master" climbers. Matched pairs, right and left. Fixed gaff.
1945-A with triangular ring at ankle.
C-1945-A complete with straps and pads.
1957-A with riveted ankle loop.
C-1957-A complete with straps and pads.

The famous Klein adjustable climber accepted as standard by many utility companies. Interchangeable right and left.
1901-MA with riveted ankle loop.
C-1901-MA complete with straps and pads.
1956-A with triangular ring at ankle.
C-1956-A complete with straps and pads.

WRITE FOR:

- Bulletin 458, showing manufacturing and testing details.
- Bulletin 154, Proper Sharpening of Climbers.

Fixed length and other patterns of climbers available. See the Klein Catalog.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
INCORPORATED
7200 McCORMICK ROAD, CHICAGO 45, ILL.

Call Graybar for Coffing Safety Pull roller chain hoists For safe, efficient lifting—specify Coffing Roller Chain Hoists. Available in 14 models, with capacities from 3/4 to 15 tons, they can be operated from either side, and will work sideways, inverted or upright. Dual ratchet and pawl construction insures that at least one pawl is always engaged, so the load is always under positive control. Safety handle will bend before any load-bearing part can fail. Get details on these and other Coffing Hoists from Graybar. It's another reason to call Graybar—for everything. Graybar Electric Co., Inc.: local service to utilities through coast-to-coast warehousing. GraybaR

633

Unique Arrangement Cuts Vault Bus Costs

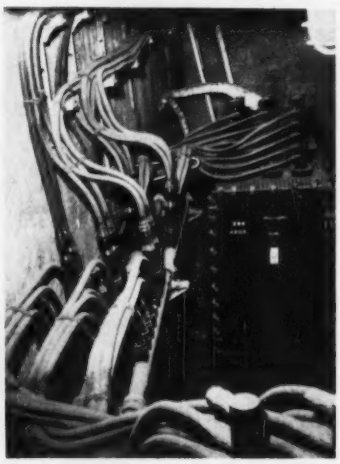
CUSTOMER'S SERVICE terminates in vault, simplifies vault bus arrangement (above). 500 MCM cable connections (below) are made with Moles

W. J. FRANSIOLI, JR, Underground Engineer, Memphis Light, Gas & Water Division, Memphis, Tenn.

Terminating the customer's 120/208-v service entrance bus in a network vault permits its use as the vault bus, simplifies and reduces vault-wiring costs.

An example of such an arrangement in a sidewalk vault having one 500-kva network transformer is shown above. Transformer leads and secondary tie cables to street mains are connected to the customer's bus with 500-MCM cable lugs. Line limiters or lug limiters are installed in secondary tie cables. The bus is installed by the customer's electrical contractor and the vault end is drilled for cable lugs and flared on 9-in. to 12-in. centers between phases.

In another arrangement, customer service cables come into the vault and connections are made with Moles. In some cases, the Moles are mounted horizontally, while on other installations the Moles are mounted vertically. Connections are made with ring bus cables.



Thermic Boring Melts Concrete

Thermic boring was employed to melt a 9-in.-dia hole through a 7-ft-thick, reinforced concrete wall at the Ffestiniog power station. The burning operation took only 26 min and saved a costly and long reconstruction.

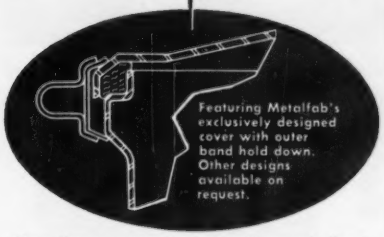
Thermic boring, which was developed in the United Kingdom by British Oxygen Co, Ltd, St. James, London, involves heating the tip of a gas-piping lance packed with small steel rods till it is red hot. Heating is then stopped and oxygen is blown through the lance. Reaction of iron oxidation at the end of the lance is maintained solely by the oxygen—the reaction temperature is sufficient to melt concrete.

The Ffestiniog operation took 720 cu ft of oxygen and six 22-ft-long, ½-in.-dia packed lances were used.

CIRCLE 26 ON READER SERVICE CARD

METALFAB DISTRIBUTION TRANSFORMER TANKS

. . . dependably built to your design



Our long experience and great flexibility of design enables us to meet all specifications . . . TRANSFORMER TANKS produced to your specific requirements — in five diameters from 12 to 21 inches, any height. Our established reputation is your assurance of economy with quality. Designed and built to NEMA standards. Prompt attention given to all inquiries.

METALFAB
INC.
BEAVER DAM,
WISCONSIN

CIRCLE 112 ON READER SERVICE CARD

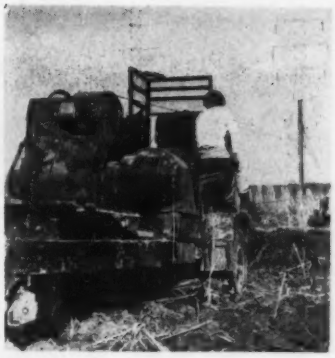
You've got to put it into YOUR HEAD first before you can take anything from it. And reading is the quickest, surest way. In the Electrical Industry that's what Electrical World is for . . . to post you on events, new technology, problem-solving methods. Your name, residence address, and title on your letterhead will bring 52 weekly copies to your home. The cost: $6—no need to pay now.

Electrical World
330 West 42nd Street, New York 36, N.Y.

Whether a Winch Line Hook or a complete Line Body check your requirements with

UTILITY TOOL & BODY CO.
CLINTONVILLE, WISCONSIN

CIRCLE 111 ON READER SERVICE CARD



M/G SET is mounted on "tensioner"

M/G Set Powers Radio

J. R. OWENS, Superintendent of Electric Distribution, Memphis Light, G &W Div., Memphis, Tenn.

A motor-generator set installed on the tensioning machine keeps batteries charged for two-way radio equipment used for communications while pulling in conductors. On this type operation, —as much as 8,000 ft of conductor may be pulled in at a time. Good radio communications between the pulling end and the pay-out end facilitate the operation and battery charging equipment is essential to good radio communications.

Fly Ash Used in Paving

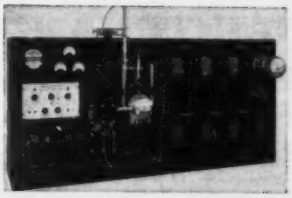
Fly ash from Perry-K Plant of Indianapolis Power & Light Co provided a principal ingredient for the paving of four areas at the company's Stout Plant. This first use of fly ash by IP&L for surfacing required 560 tons of fly ash to pave 10,000 sq yd.

The project began with the removal of 2½ in. of topsoil and the loosening of the next 4½ in. of earth. After fly ash was spread over the loose earth at 103 lb per sq yd, and 100 tons of lime was distributed at 21 lb per sq yd, the materials were mixed thoroughly and area was sprinkled, leveled and compacted.

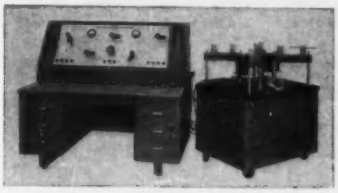
After being saturated with a liquid asphalt sealer, the area was allowed to set for a week before application of a 1-in.-thick asphaltic concrete wearing surface completed it for traffic.

STATES TESTING EQUIPMENT

OFFERS EXTRA FEATURES



COMBINATION WATTHOUR AND DEMAND METER TEST TABLE



5,000 AMP. CURRENT AND POTENTIAL TRANSFORMER TABLE

GANG TEST TABLE WITH PHOTO ELECTRIC CONTROL

ROTATING STANDARD CALIBRATING UNIT

THE STATES COMPANY

Write for full details on Test Table Line

THE STATES COMPANY
3 New Park Ave., Hartford, Conn.

CIRCLE 81 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

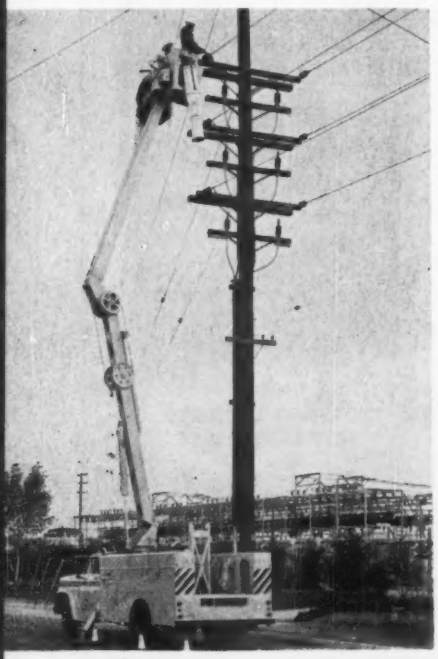
E u m

MAINTENANCE & REPAIR

PREPARING for connector maintenance job, two linemen check equipment before climbing aboard their Strato-Tower—groundman is not required here

ADDITIONAL STOPS one truck can make cut maintenance costs 25%

TOWER has eliminated climbing through lower lines to work on top



Aerial Tower Cuts Connector Maintenance Cost

E. S. WEBB, Sr. Estimator, Southern California Edison Co, Covina, Calif.

Use of a double-basket aerial tower in performing distribution line maintenance work cuts costs by 25% compared to former climbing operations.

Like most utilities, for its connector maintenance program Southern California Edison Co has used a three-man crew: foreman, lineman and groundman. Set-up, pole climbing, attaching rubber covers and other make-ready jobs limit the number of replacing and cleaning operations such a crew can handle in one day.

To help crews work more efficiently and more easily, SoCal-Edison bought a 45-ft hydraulic aerial tower known as the model 500 Strato-Tower, produced by Young Spring & Wire Corp. Mounted on a GMC chassis with utility body, the unit is maneuverable and mobile. Duties of the groundman were eliminated, since the tower's 500-lb lifting capacity permits the two-man basket crew to take whatever tools are needed up with them.

A control at the basket lets the crewmen move the basket as desired. The crew baskets and the upper boom are made of Fiberglas and designed for 30-kv insulation — protective rubber blankets normally required when climbing through energized lines sometimes can be eliminated.

In operation, the new work routine is quick and simple. The truck rolls to a stop and the driver steps outside, flicks a lever and positions the hydraulic outriggers to stabilize and level the truck. Meanwhile, the other crewman chooses the tools needed for the job and puts them in the crew baskets. With both men aboard, the boom raises them to the work level of the lines. If it is necessary to replace the connector, hot sticks are used to apply jumpers and remove connectors. With a wire brush on a hot stick, the conductor is then cleaned until bright. A special grease is applied to the conductor and the interior contact surface on the connector. The new connector is installed and tightened, and a special grease is applied to the entire assembly to prevent moisture and corrosive agents entering.

Acting Foreman A. L. Mitchell commented about the new machine, "I feel a lot less tired than I used to. One nice thing about this unit is that it prolongs the active careers of linemen."

(More Maintenance on page 84)

CIRCLE 27 ON READER SERVICE CARD

Here are five important questions . . . and their answers . . . on an important new Simplex development in electric power distribution and transmission

HIGH VOLTAGE POLYETHYLENE

INSULATED POWER CABLES

Q. *What are some of the advantages of Simplex polyethylene-insulated high voltage cables?*

A. Low dielectric constant (nearly 1/2 that of paper cables) . . . Low power factor (nearly 1/10 that of paper cables) . . . Low dielectric loss (nearly 1/20 that of paper cables) . . . Very high insulation resistance (at least 10 times that of paper cables) . . . High dielectric strength . . . (equal to paper cables).

Q. *What are some of the outstanding physical properties of Simplex polyethylene?*

A. Light weight (62% of paper cables) . . . High tensile strength (1800-2000 p.s.i.) . . . High elongation (400% minimum).

Q. *Where can Simplex polyethylene cables be used?*

A. In many places where rubber or paper cable is used. Typical installations are direct burial, duct or conduit, aerial and submarine.

Q. *What is the highest voltage at which Simplex polyethylene cables are rated?*

A. Simplex now has polyethylene cable rated as high as 46KV A-C. Development work now in progress is expected to extend Simplex polyethylene's voltage range to 69KV or higher.

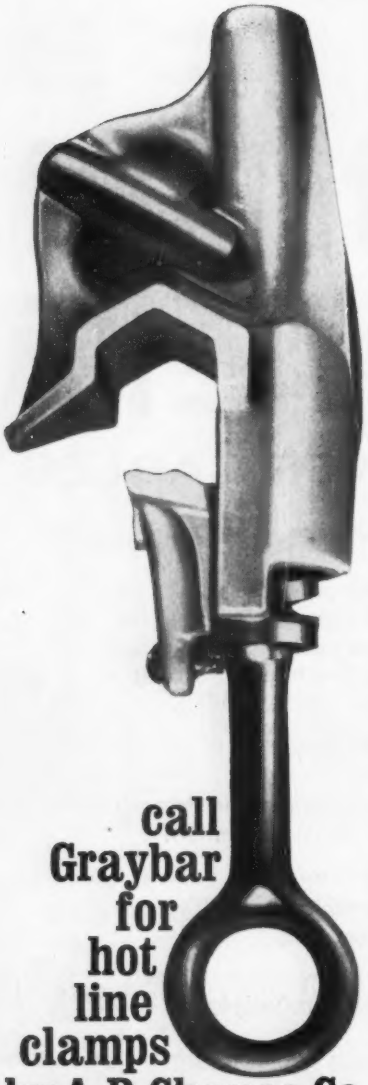
Q. *Has Simplex high voltage polyethylene cable been thoroughly field tested?*

A. Yes, as the leading producer of polyethylene cables, Simplex has in service more than 330 mile-years of polyethylene-insulated cable in the 5KV to 46KV range.

Send for complete information.

Simplex
WIRE & CABLE CO.

EXECUTIVE OFFICES: Cambridge, Mass.
Plants at Cambridge, Mass., Portsmouth, N. H., Westbury, L. I., Monrovia, Calif.



call Graybar for hot line clamps by A.B. Chance Co.

Chance "P.C." Hot Line Clamps give you 5-way assurance of long service life: fully-enclosed threads for protection against corrosion . . . threads recessed to prevent arc damage during installation . . . wide clamp jaws for even current distribution . . . fatigue failure prevention by design which eliminates stress concentrations . . . protection against mechanical failure through top-notch quality control and testing. Chance "P.C." Hot Line Clamps are available for every contact combination—from Graybar. It's another reason to call Graybar—for everything. Graybar Electric Co., Inc.: local service to utilities through coast-to-coast warehousing.

GraybaR

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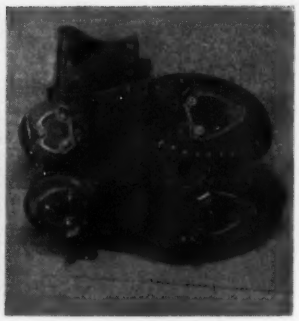
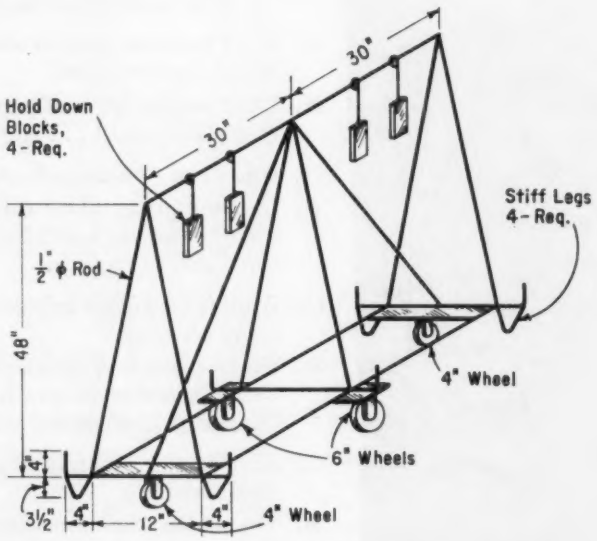


Cleats on Boots Make Hillside Mowing Safer

Baseball cleats turned out to be Tennessee Valley Authority's answer to problems of both safety and speed involved in mowing grass on steep slopes.

Power mowers now have been especially designed to operate rapidly and effectively over hillsides. The trouble was that it was hard for an operator to keep up with them, and do it safely. With cleats on his boots, John C. Maxwell finds mowing the grass on slopes around TVA's Fort Loudoun Dam much easier than when he was slipping and sliding on his boot soles.

With the cleats, and the especially designed mower, one man can mow hillsides in the same length of time it previously required three men to do the job.



Carrier Makes Handling Sheet-Metal Easier

A sheet metal carrier, designed at the Tennessee Valley Authority's Widows Creek plant, provides a place for keeping flat sheets of metal so they will not be on the floor where they will be a hazard and also offers an easy way to transport this hard-to-handle material around the plant.

The cart is 60-in. long and slightly more than 4-ft high. It has four wheels, a 4-in. wheel in front and back and a 6-in. wheel centered, on either side. The slight difference in wheel sizes makes it possible to turn the carrier easily in close quarters. The design also provides a three-point contact at all times except when turning. Stiff legs on each corner of the carrier prevent tipping.

(More Maintenance on page 86)

ANY MAN CAN WEED-PROOF 10,000 SQUARE FEET IN TEN MINUTES...with UREABOR®31

Get lasting protection from weeds and grasses this easy low-cost way

A SPECIAL SPREADER simplifies and speeds the UREABOR 31 applications at low rates with accuracy. Spreader holds enough UREABOR 31 to treat 1250 sq. ft. without refilling; weighs a mere 6 lbs. Width of the swath can be adjusted.

STANDARD PACKAGE IS 50 LBS. UREABOR 31 is packed in multiwall paper sacks for easy handling—easy storing. A convenient package, easily disposable, for spotting at predetermined intervals to facilitate large-area applications.

UREABOR 31 IS 3 HERBICIDES IN 1 The plant-destroying powers of 3 proven herbicides are combined in this granular mixture of sodium borates, substituted urea, and trichlorobenzoic acid to yield fast, long-lasting, nonselective results.

UREABOR 31 is a special weed killer for industrial grounds. It lowers maintenance costs... protects property... and improves appearance. UREABOR 31 is effective on a greater variety of weeds and grasses than any other herbicide now on the market. A single dry application gives year-long control! Yet it takes only 1 to 2-lbs. per 100 sq. ft. to do the job! As a granular material, UREABOR 31 is always ready to use... and safe to handle. It's a big time saver too... any man can easily weed-proof ground at the rate of 1,000 square feet per minute.

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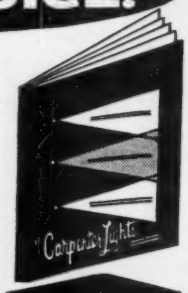
CIRCLE 85 ON READER SERVICE CARD

For Every Need . . . Every Budget!

MAKE YOUR OWN CHOICE!



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There are complete lines of Carpenter Emergency Lights for all basic needs . . . the widest choice of powerful, dependable, durable lights available.

WARNING LIGHTS: Vehicle and stationary types . . . colored, flashing, oscillating, revolving!
HANDLIGHTS: Powerful "Portalites" with the famous extra-wide coverage! Rechargeable or dry battery types.
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PANIC LIGHTS: Watchmaster "Automatalites" **automatically** guard against light failures. All types including explosion-proof, dust-tight, and remote control.

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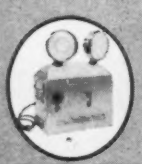

CIRCLE 108 ON READER SERVICE CARD

TRIAL SAMPLES

Of World-Famous WHITMORE'S Lubricants

OPEN CHAIN LUBRICANT INCREASES CHAIN LIFE UP TO 300%

Penetrates, lubricates, prevents rust. Lubricates deep into chain linkage to reduce friction on pins, rollers, bushings, pressure surfaces. Corrosion inhibitor prevents rust in vital working mechanisms. Lubricates close-tolerance internal surfaces to increase chain life up to 300%. Highly recommended for all climatic conditions to stop rust and corrosion even in salt atmospheres.

Packaged in handy 16 oz. aerosol spray-on containers or in bulk—send for a free trial sample.

ANTI-FRICTION COMPOSITIONS HAVE NO MELTING OR DROPPING POINT

Packaged in 14½ oz. cartridges for handy application with lever-type cartridge guns for constant protection to roller, ball, sleeve bearings and sliding surfaces in "hot" bearing applications or in areas with high ambient heat. Exclusive formulas have no melting or dropping point; moisture resistant; will not wash out; exceptional metal adherence properties; temperature reducing qualities; high extreme pressure values. Available in two grades. Whitmore's Anti-Friction Composition No. 1 (light density), recommended for high speed, high temperature applications. Anti-Friction Composition No. 2 (heavy density), for low-speed high-temperature applications or loosely-fitted bearings. Specify No. when requesting free trial sample.

68 YEARS OF LEADERSHIP LUBRICATING THE FOLLOWING:

- Open Gears, Dipper Sticks, Cams
- Open and Enclosed Chain
- Speed Reducers
- Enclosed Gear Cases
- Roller, Ball and Sleeve Bearings
- Wire Rope and Cable
- Hydraulic Units, Torque Converters

Est. 1893

THE WHITMORE MANUFACTURING CO.

LUBRICATING ENGINEERS

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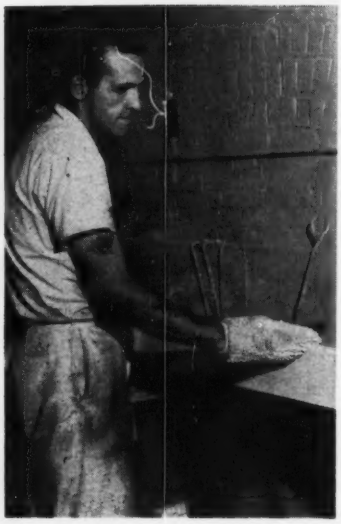


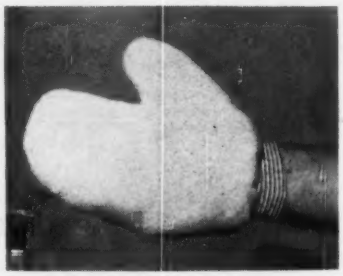
Mitten Speeds Barricade Painting

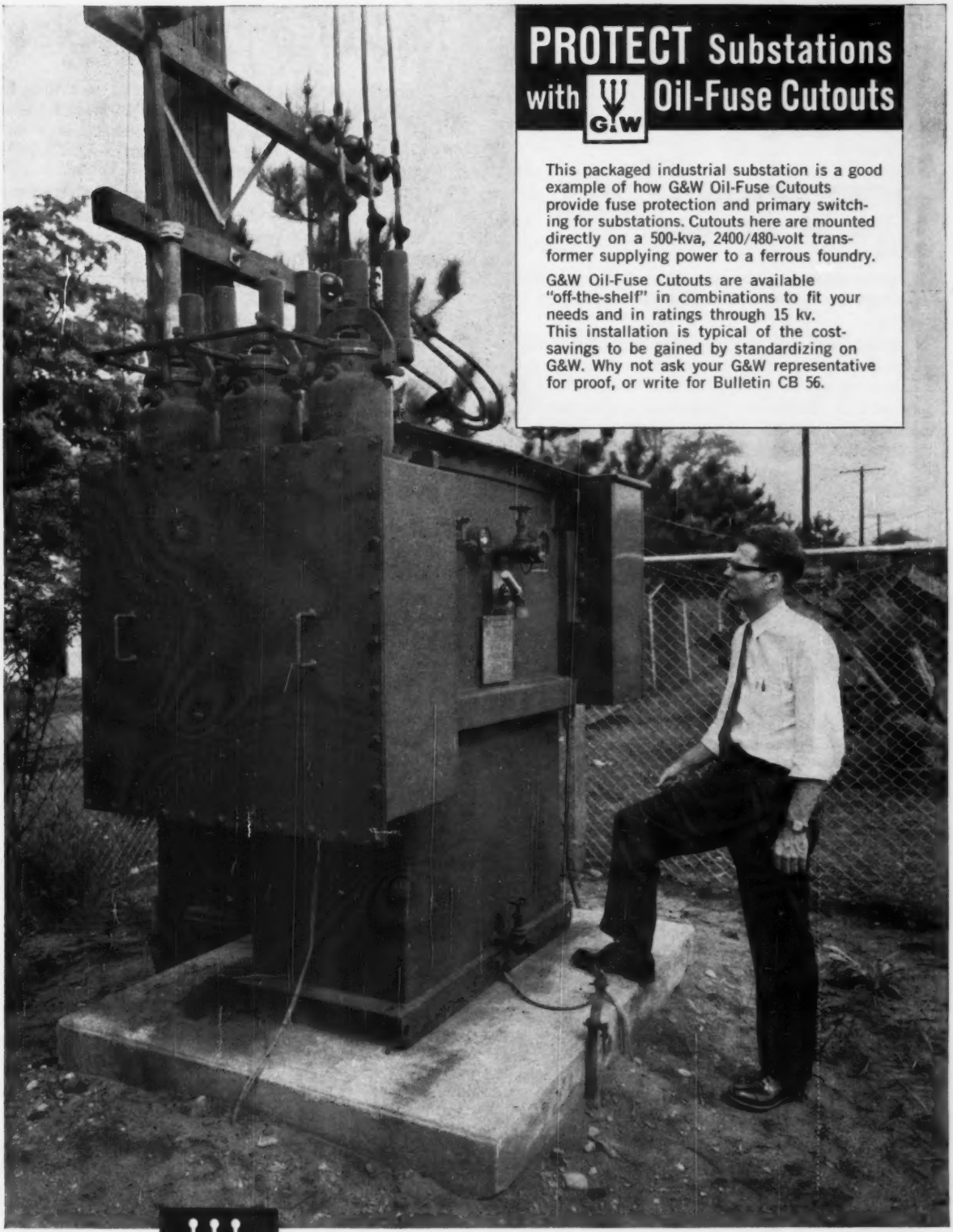
Mittens, made of the material used for paint rollers, are being used in the shops of the Memphis Light, Gas and Water Division to speed up the painting of irregular objects such as barricade pipes, boards, stands and signs. The mitten is worn like any mitten, except that it can be worn on either hand. The entire outside of the mitten can be used.

With the mitten on the hand, the hand is dipped into the paint and then passed over the object to be painted. The hand can shape the mitten to the surface of the object being painted. If one arm gets tired the mitten may be changed to the other hand.

Two or three times as much painting of this type can be done with the mitten as can be done with brushes in the same amount of time. Also, less paint is used for the same amount of painting.

CIRCLE 28 ON READER SERVICE CARD





PROTECT Substations with G&W Oil-Fuse Cutouts

This packaged industrial substation is a good example of how G&W Oil-Fuse Cutouts provide fuse protection and primary switching for substations. Cutouts here are mounted directly on a 500-kva, 2400/480-volt transformer supplying power to a ferrous foundry.

G&W Oil-Fuse Cutouts are available "off-the-shelf" in combinations to fit your needs and in ratings through 15 kv. This installation is typical of the cost-savings to be gained by standardizing on G&W. Why not ask your G&W representative for proof, or write for Bulletin CB 56.

G & W ELECTRIC SPECIALTY COMPANY

3500 WEST 127th STREET • BLUE ISLAND, ILLINOIS

CANADIAN MFR. • POWERLITE DEVICES LTD. • TORONTO, MONTREAL & VANCOUVER

superior quality standards — inspired specialized design

C 61-1

ELECTRIC UTILITY METHODS

EUM

OPERATIONS & TESTING

Rigid Control of Glove

S. S. HASBROOK, Safety Supervisor, Electric Distribution Dept, City Public Service Board, San Antonio, Tex.

Complete, rigid, and regular laboratory inspection and testing of linemen's rubber gloves pay dividends in greater safety for the men whose lives depend on the gloves. Reduction in the number of gloves condemned and removed from service is a substantial side benefit.

For over 20 years at City Public Service Board, rubber gloves have been laboratory inspected and tested on a weekly schedule. The compact area served by the Board allows fast and relatively easy return of the gloves to the test facilities. However, complete, accurate, and comprehensive records of rubber-glove testing were not maintained during that time, nor were such required.

In August, 1960, a new testing laboratory in the meter repair shop opened for service equipped with new test equipment (except the rubber-glove inflator) and new support facilities. In addition, a written procedure covering shop inspection, transportation of gloves to service centers, storage and field inspection of gloves, and the inspection schedule was placed in effect. A complete record system also was started.

Under the new system individual workmen are not issued specific pairs of gloves. The frequency of shop inspection obviates the need and eliminates the extra time and labor required to match a particular pair of gloves and return them to the proper workman. All trucks are issued two pairs of gloves for each lineman plus two additional pairs. Gloves used during the week are exchanged according to the schedule; gloves carried as spares on the trucks are put into service by the linemen. Gloves issued in exchange for those used the week before are carried as spares. This assures rotation and return of gloves to the test room for inspection.

Rigid control exercised over the gloves aids in assuring workman of clean, safe gloves when he receives them from the storeroom. Used gloves turned in at one of the storerooms are placed in a large, sturdy, wooden box along with many other gloves. The box is padlocked by the storekeeper and shipped to the laboratory. Personnel at the laboratory have the only duplicate key to the box, thus assuring no tampering with the gloves while in transit.

The four captioned photographs on the adjacent page describes the travel of the rubber gloves through the testing laboratory. When the gloves have passed through this sequence, they are paired according to size and length of the gauntlet (both 14-in. and 16-in. gloves are used), and sealed in a clear pliofilm bag. This bag is sealed in a cardboard box, which is then dated, identified and stored.

Shipping of gloves and issue from the storerooms is covered in the procedure. Gloves remain in the boxes during shipping; boxes are placed in the wooden box which is padlocked, to be opened only by the storekeeper at the storeroom. When gloves are issued to workmen, they are removed from the cardboard box, but not from the pliofilm bag. Gloves remain in the bags on the trucks until removed by their user.

The procedure also directs the manner in which gloves shall be stored in special compartments on the trucks, and outlines proper care and field inspection. Linemen may decline to use any gloves, new or used, that they feel are unsafe. These may be returned for exchange; however, workmen are forbidden to mutilate, destroy, or further damage any gloves they may decline to use. All gloves must be returned to the test room for final disposition.

All gloves remaining on the storeroom shelves after 90 days are returned to the test room for re-examination and dating. Anytime the pliofilm bag protecting a pair of gloves is opened for any reason, the gloves are not placed back in storeroom stock but must be returned to the test room.

Line Truck 'Housekeeping' Improves

Frequency of laboratory tests and the rigid controls on the handling of gloves has not led to such a feeling of security that workmen have failed to properly care for them in the field. On the contrary, prior to establishment of the procedures and the new testing facilities, a major safety problem existed in attempts at education and enforcement concerning the proper care of rubber protective equipment. Storage on trucks was considered poor at best; field inspection was a hit-or-miss procedure; and mutilation of suspected unsafe gloves in the field was such that some gloves were purposely "lost" to prevent their return.

Records compiled in the laboratory since August, 1960, show a picture of almost amazing improvement. These records, logged daily and summarized monthly, include the total number of gloves received in the test room, number and percentage of gloves visually condemned and electrically rejected, sizes and gauntlet length of condemned gloves and whether left or right hand, and unusual conditions. As the laboratory tests, shipping, storage, and handling procedures improved, the care and inspection efforts of men in the field improved accordingly.

During the month that the new test room went into operation under the strict procedure, 41.3% of all Class I rubber gloves received were visually rejected; 0.2% were electrically condemned; and only 58.5% were returned to service. But within

Tests Pays Dividends

three months, in October, 1960, only 11.8% of the gloves received were visually condemned; 0.7% were electrically rejected; *and 87.5%* were returned to service. By July, 1961, only 4.5% of the gloves received were visually rejected; 0.2% were electrically condemned and *95.3%* were returned to service. Replacement cost of the 41.5% condemned in August, 1960, is about $1,070.00, whereas replacement cost of the 4.7% condemned in July, 1961, is only about $209.00.

Mutilation of gloves by field personnel is forbidden by the procedure and for a very good reason. Determination of the original defect that caused a glove to be discarded is usually very difficult if the glove is further mutilated. The benefits of detecting trends in rubber glove damage thus may be lost.

Records Eliminates Damage at the Source

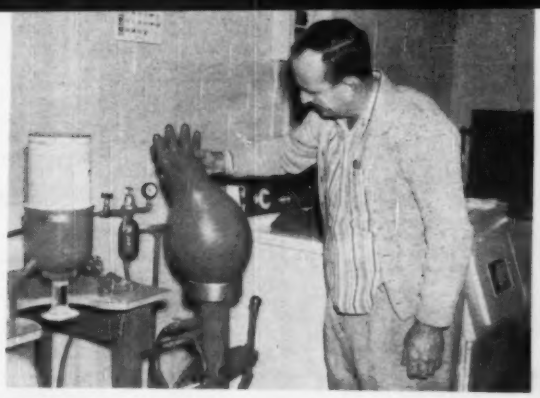
Through keeping of records, laboratory personnel noticed a considerable number of left-hand gloves being visually rejected due to mechanical damage on the thumb or forefinger. Investigation revealed that linemen were holding a particular compression fitting on the conductor with the left hand while making the first indent on the fitting, and were pinching the fingers of the glove in the process. But because of the natural bulkiness of rubber gloves and leather protectors, linemen frequently never knew the cause of the damage. However, when the frequency of damage and the cause was brought to their attention, along with the obvious possibilities for injury, this damage cause was practically eliminated.

Cooperation between field and test personnel also uncovered another cause of glove damage. Staples used for attaching ground wires to poles are standard, rough cut, wire staples. Under certain conditions, the point of the staple may penetrate both the protector and the glove. This may not be readily detected at the time by the lineman. Field personnel have been advised of this possibility of damage. A better method of attaching ground wires to poles is under consideration.

In the first year of operation, the new testing facilities handled 16,013 rubber gloves (average of 1,300 gloves per month), 769 rubber blankets, 536 line hose, 164 hot-sticks, 74 pole guards, and 52 insulated compression tools and boltcutters. In addition, tests on insulated jumper cable, acceptance tests on hard-hats, and many special tests were conducted. The laboratory also tests rubber gloves for nearby military installations, electrical contracting firms, and nearby small utilities as a courtesy.

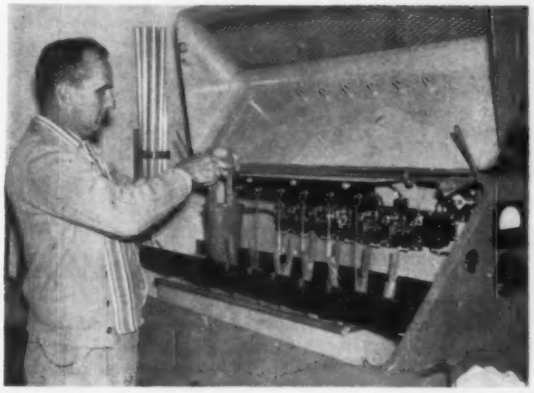
CIRCLE 29 ON READER SERVICE CARD

(More Operation on page 90)



RUBBER GLOVE is blown up to about three times normal size on the inflator. Entire surface of the glove is closely examined under a strong light; any defective glove is notched in the gauntlet and then discarded

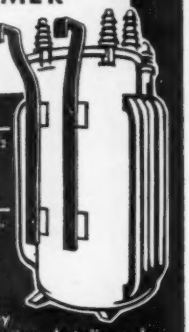
AFTER WASHING with mild soap in tumbler-type washing machine, 20 to 25 at a time, gloves are thoroughly dried on special rack, designed by laboratory personnel, which circulates air over entire inner surface



ELECTRIC BREAKDOWN TESTS in tap water are conducted on 6 gloves at a time. Regular Class I, 10-kv gloves are tested at 10 kv for 3 min; LV gloves at 5 kv, also for 3 min. Current leakage is measured

AFTER DATING with a special ink, which will remain legible for several months, gloves are lightly dusted inside with a commercial-grade talcum powder, by means of an air-powered rig designed by lab personnel

THIEL
TRANSFORMER HANGERS



MODEL	C-1	C-3
Transformer	75-100 KVA Single-Phase	75-112½ KVA Three-Phase
Weight	46 lbs.	100 lbs.

Thiel Hangers are made to NEMA specifications. Heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts stocked for immediate shipment.

HANGER KICKERS
Sizes to fit T-Type hangers.

T-TYPE HANGERS
Two sizes, for 3-50 KVA 1-Phase and 9-45 KVA 3-Phase transformers.

THIEL TOOL & ENGINEERING CO., INC.
1417 N. MARKET ST. LOUIS 6, MO.

CIRCLE 109 ON READER SERVICE CARD

DON'T DIG THROUGH BURIED PIPELINES!

Find them fast with

DETECTRON "505"

This portable precision instrument makes short work of determining exact location and depth of buried pipes, cables, manhole covers. Not a radical experimental design, but proven by years of use in municipalities and industry. Full effectiveness in *all* temperature ranges.

Housed in rugged aluminum case, Detectron "505" features shielded loops and locked-in tuning for pinpoint accuracy; unit construction for simple maintenance. WRITE TODAY FOR DATA AND LOW PRICES.

DETECTRON
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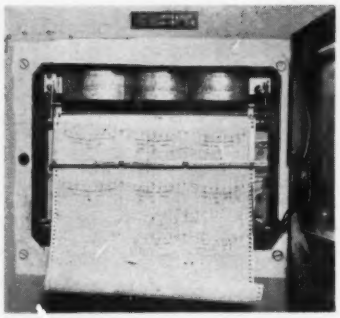
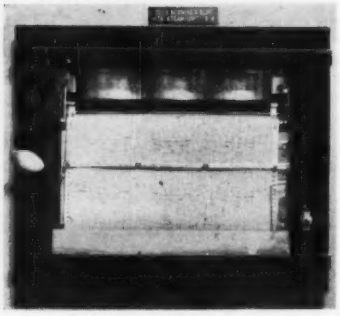
SAN GABRIEL CALIFORNIA





RE-ROLLER provides 24-hr chart . . . yet permits recorder door to close

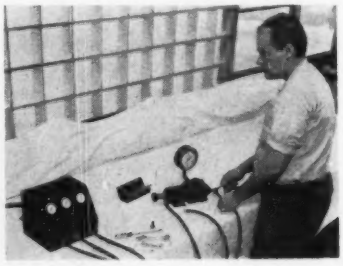
Modify Recorders to Improve Appearance

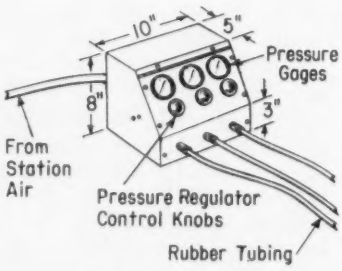
A chart re-roll device, shop-fabricated from obsolete recorder equipment, is providing Tennessee Valley Authority with an economical solution to unsightly recorder charts. Furthermore, the device permits "close-door" operation thereby preventing recorder damage from dust and dirt.

At Widows Creek steam plant of the TVA, the six-point recorders on the vertical control boards were originally designed to use a continuous roll chart. TVA's practice of cutting the charts every 24 hr made it necessary to leave the door of the recorder open. To keep the charts feeding, weights often had to be hung on the bottom of the chart—an unsightly picture.

The instrument mechanic foreman adapted a roller device from another type of recorder, developed a new chart guide and produced a satisfactory "24-hr" chart re-roller.

Doors are now closed, dust is kept from the recorder, and the chart gives a better record.





Plumber's Nightmare Eliminated

Boiler and turbine air-operated controls at The Dayton Power and Light Co's Hutchings Station are now being tested quickly and efficiently with a "black box" devised by technician Thomas S. Burns. Furthermore, the device eliminates the big plumbing job normally required each time the controls had to be tested.

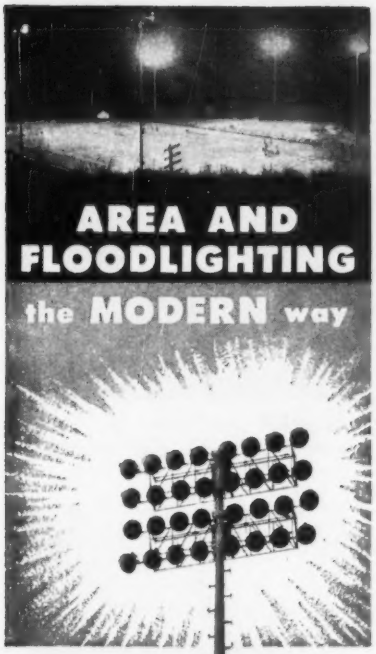
The tester is built around a small 8 x 10 x 8-in. metal box from which three separate and easily controllable air signals are available for testing controllers.

At the back of this box is a fitting which can be attached to an air hose from any of the station's compressed air supply. Inside the box are three Fisher Type 67 air regulators supplied from a manifold.

From each of these regulators is connected a pressure gauge and a 5-ft length of flexible rubber hose, which can be attached to the gauges to be tested.

The savings on copper tubing previously used on one testing, more than pays for the tester.

CIRCLE 30 ON READER SERVICE CARD

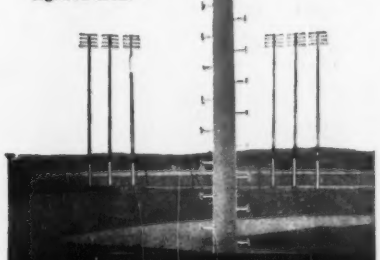


TULITO

TAPERED STEEL LIGHTING TUBES

For
- Baseball Diamonds
- Football Fields
- Playgrounds
- Shopping Centers
- Truck Terminals
- Railroad Yards
- Race Tracks
- Radio and TV Towers
- Transmission Power Lines

Engineered for Permanence, Strength and Safety...
Designed to accommodate from 2 to 40 lights.
Streamlined to enhance the appearance of any lighted area.



MEYER MACHINE, INC.
RED WING, MINNESOTA

CIRCLE 110 ON READER SERVICE CARD

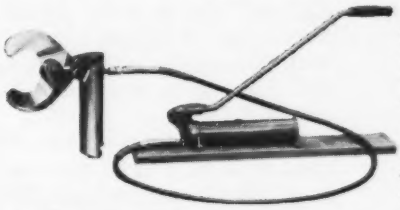
Cut 3" Cable with HKP

HYDRAULIC CUTTERS

HAND or POWER OPERATED

NOW — HKP ADDS HYDRAULIC POWER to its CABLE CUTTERS to give you FASTER, EASIER CABLE CUTTING — ON THE JOB — OVERHEAD — UNDERGROUND!

HKP Hydraulic Cable Cutters cut up through 3" copper and aluminum communication cable (not ACSR). Cutting blades are drop forged and induction hardened to withstand pressure and give long blade life. Ram is adjustable to compensate for wear on cutting blades. 2" and 3" diam. capacity models available.



HAND-HYDRAULIC POWER — for all those cable cutting jobs
Fast-acting hydraulic pumps force hydraulic fluid through high pressure hose to the ram assembly to deliver 25,000 P.S.I. pressure to the cutting edges. By-pass valve, two filter screens plus magnet in the pump prevent damage from overloading and assure long, trouble-free service.

POWER-HYDRAULIC POWER — for fast or multiple cutting
These are the same basic units as in the Hand-Hydraulic line, but are designed for use with an HKP Hydraulic Power Unit. Convenient, pistol grip and holding handle provide better cutting positioning and reduce fatigue. Positive-action push button on pistol grip safely controls hydraulic cutting action.

THE POWER SOURCE
Portable, self-contained HKP HYDRAULIC POWER UNITS (many types available to operate up to 4 workheads) provide the power to operate any HKP Power-Operated Hydraulic Cutterhead.

Start now to save time, effort and money with these HKP Hydraulic-Power Cable Cutters. Call your HKP Representative today. He'll help you select the right combination of HKP Hand or Power Operated Hydraulic Cutters to meet your specific requirements.
Other HKP Hydraulic Cutters for cutting soft and medium hard coarse stranded guy wire, wire rope and cable, all hard metals, concrete reinforcing rods, stainless steel, etc.
See your friendly distributor or write for complete Porter Catalog.

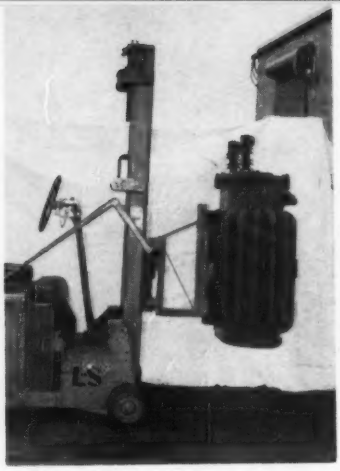
HKP® H.K. PORTER, INC.
SOMERVILLE 43, MASS.

CIRCLE 91 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

E u m

STORES & SHOPS



TRANSFORMER of varying configurations are readily accommodated

ADAPTER lifts transformer, yet retains standard fork-lift attachment

Adapter Simplifies Handling Distribution Transformers

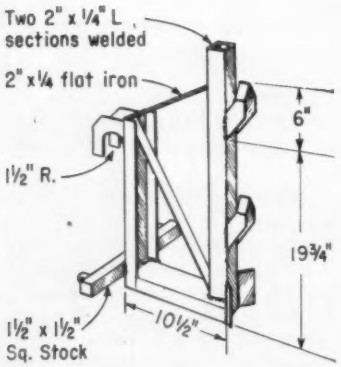
JOHN DOWDELL, Substation Dept. Atlantic City Electric Co Atlantic City, N. J.

Atlantic City Electric Co is now moving distribution transformers with a fork lift truck equipped with a newly devised transformer lift adapter attached. With this adapter, one man does this work safely and more efficiently.

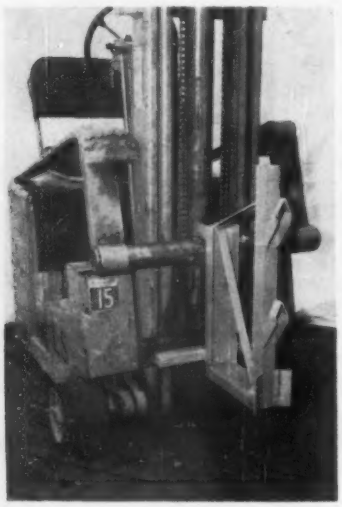
The improved method was devised by a member of the company's substation department. The transformers involved range in size from 5 kva to 100 kva with the larger ones weighing approximately ½ ton. Previously, the moving of these transformers was done with a hand truck for the small ones and a floor crane for the larger ones. The job was difficult and unsafe and usually required two or three men to accomplish it.

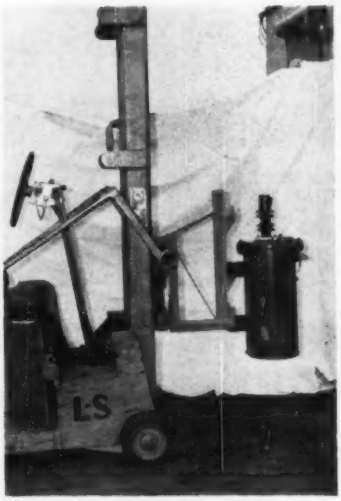
The adapter, as detailed in the adjacent line drawing, was designed to accommodate a specific range of transformer sizes. Other sizes of transformers can be accommodated simply by varying the dimensions between lifting hooks.

It took about 16 hr to construct the adapter and the material used consisted of 80 lb of scrap metal plus steel welding rods and paint.

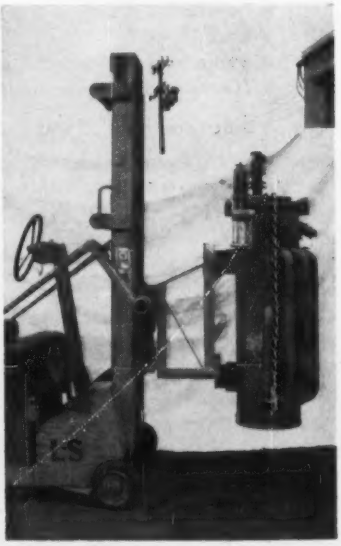


TRANSFORMER LIFT ADAPTER readily hooks over lift's arbor. It was shop-built in 16 hr from scrap





SMALL TRANSFORMERS are supported by lower tongue, side bar



LARGER UNITS are similarly supported from the uppermost tongue

This marker frees one man from tracing cables

The Amprobe Cable Tracer* enables you—by yourself—to trace ten uncoded circuits simultaneously ten times faster than any other method. Simply plug one end of the conductors to be traced into the markers (there are ten of them), the other ends, in pairs, into the pocket-sized Cable Tracer, press the button, and a number lights up to provide unmistakable identification. See your distributor or write today for more details.

Here are some typical, broad category applications:
■ Trace commercial and residential meter circuits.
■ Identify control cable circuits at substations, plants.
■ Check power cables used in auxiliary equipment.
■ Trace switch panelboard circuitry. ■ Test for opens and shorts. *$39.50 (slightly higher outside U. S.).

AMPROBE INSTRUMENT CORP.
LYNBROOK, NEW YORK
CANADA: ATLAS RADIO CORP., 50 WINGOLD AVE., TORONTO

ELECTRIC UTILITY METHODS

SAFETY

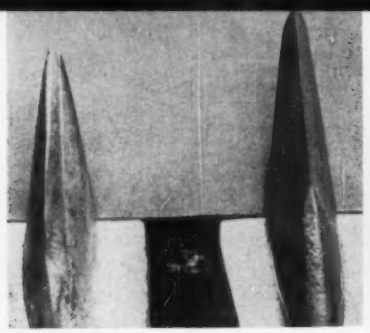


FIG 1 RIDGE of gaff should be straight, (as at right) never filed flat

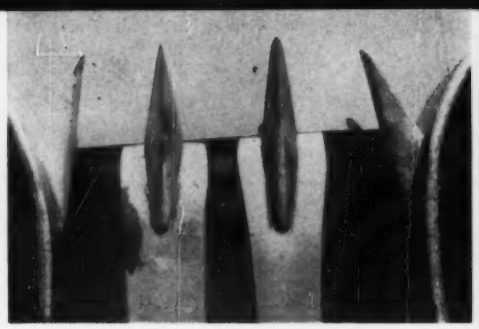
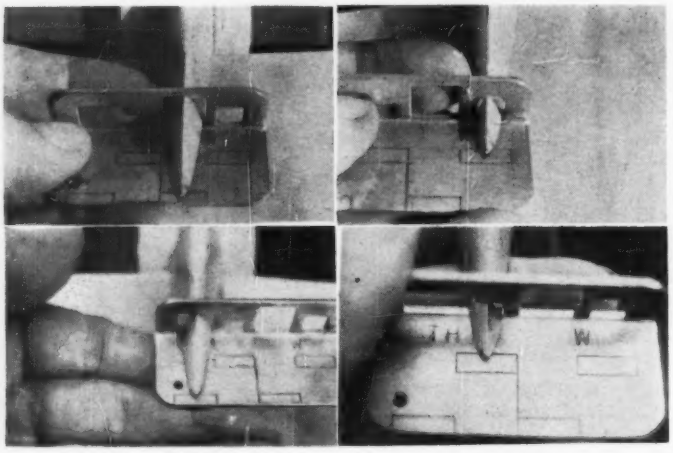


FIG 2 GAFF (left) shows undesirable "needle" type; on right, correct type

Maintenance and Inspection of Climber Gaffs



Always use a gaff gauge when filing climbers. To check for correct width, insert the gaff as far as possible through the *large* square hole of the gauge in the section marked *W*. The point should fall within the limits formed by the last line and the edge of the gauge, to provide proper width of the gaff about 1 in. from the point. Next insert the gaff as far as possible through the *small* hole in section W. The point should fall within the limits formed by the two center lines to provide proper width of the gaff approximately ½ in. from the point.

To check for correct thickness, insert the gaff as far as possible through the *large* slot in section marked *TH*. The point of the gaff should fall within the limits formed by the last line in the edge of the gauge to provide the proper thickness of the gaff approximately 1 in. from the point. Next insert the gaff as far as possible through the small slot in the section marked *TH*. The point should fall within the two center lines to provide a proper thickness ½ in. from the point.

To maintain correct *width* the gaff should be placed uppermost so that you can file from the heel to the point. File toward the point and down to the edges of the underside of the gaff. Use the file sparingly along the sides, removing only sufficient material to make a good point. Follow the original shape of the gaff.

To file the gaff for proper *thickness*, place the climber in a smooth-jawed vise, or a vise with wood-block inserts to keep from scoring the shank. Use a sharp, fine file and hold it with both hands. Start the filing action from the base of the gaff and pull the file toward the point. The flat side of the gaff should be left perfectly straight to within ¼ in. of the point, then rounded slightly toward the top ridge on a radius of ¼ in. Never use a grinding wheel of any kind as it may spoil the temper and make the gaff dangerous to use.

Some Do's

The following tips on the proper care and use of climbers have been abstracted from a sound-slide film produced through the joint efforts of Bureau of Safety of Middle West services and by Mathias Klein & Sons. Photos for the article were selected directly from the slide film. The sound-slide film also covers tips on pole climbing.

Ever since linemen started to use climbers, there has been the problem of repairing and sharpening gaffs. Although there is ample information available on correct methods, a large percentage of climbers are incorrectly sharpened. Fig 1 shows an example of one of the incorrect methods. The ridge has been filed flat. The ridge should always be perfectly straight and should never be filed except to correct damage. Even then the orginal shape should not be changed.

The pair of gaffs on the left of Fig 2 shows another example of a sharpening method that should not be used. The original shape, illustrated by the pair of gaffs on the right of Fig 2, was engineered to provide maximum strength and life consistent with comfort and ease in climbing. When much of the original metal has been filed away, it no longer provides the safety factor necessary to achieve a proper compromise in strength, wear and ease of climbing. The needle-point method of sharpening climbers should not be used.

The gaffs on the left of Fig 3 show a condition that often results from incorrect climbing

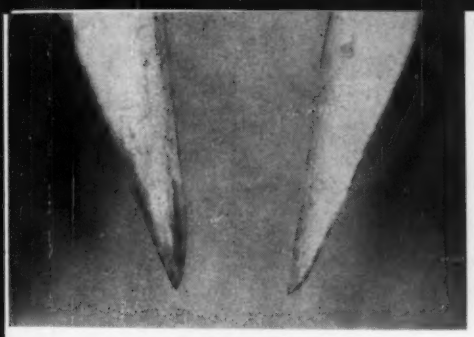


FIG 3 'SNEAKING' up pole, lineman drags climber to wear point off gaff

FIG 4 GAFF GUARDS help keep gaffs sharp, eliminate accidents

FIG 5 BUNCHED-UP TROUSER under pad can cause irritations

and Dont's on Climbers

methods. When a lineman "sneaks" up a pole, he drags his climber against the pole, wearing the point of the gaff. A gaff in this condition tends to work *out* of the pole rather than to work *in,* thus increasing chances of a cut-out. This condition can also happen when a person is unskilled in the art of sharpening gaffs. See boxed instructions for sharpening, and testing gaffs.

After repeated use and a number of sharpenings, climbers will be worn to the point where they are too short and unsafe to use. It is recommended that gaffs shorter than 1¼ in. be replaced. Short gaffs will not penetrate deep enough through shellrot to engage solid wood.

To help keep gaffs sharp, use a gaff guard when the climbers are not being used. Gaffs will not require sharpening as often and will give longer life. Furthermore, other equipment stored near the climbers will not be damaged by the sharp gaffs.

A good pair of ankle straps is an excellent investment. These straps come in either leather or nylon. Nylon is slightly more expensive but will more than likely last longer than leather.

It is important to wear ankle straps correctly. When the strap is not placed around the leg iron, there is too much play in the climber and it cannot be properly controlled. A bunched-up trouser under a climber pad can cause irritation, rubbing along the lineman's leg Fig 5. It is advisable for the lineman to straighten out the pants leg before placing the climber pad against his leg and tightening the strap. This will allow the shank of the climber to rest comfortably against his leg instead of being a source of constant irritation.

Climbers have figured prominently in many preventable accidents. Wearing them under trouser legs is not a safe practice when the trousers are long and are cuffed. Gaffs are easily caught in the cuffs, either tripping the lineman or causing him to gaff himself. If lineman insist on wearing their climbers underneath their trousers, they should make certain that their trousers are shorter and not cuffed.

Many painful injuries occur every year when linemen fail to remove their climbers when they are performing work on the ground. More and more linemen are recognizing the importance of this practice. They have become so accustomed to putting on and removing their climbers that each operation takes only a few seconds.

By carrying climbers from pole to pole they will give much additional safe service. The gaffs are not damaged or dulled by concrete and stones. This means that sharpening of the gaffs is required less frequently. Best of all, linemen are not gaffing themselves or other employees.

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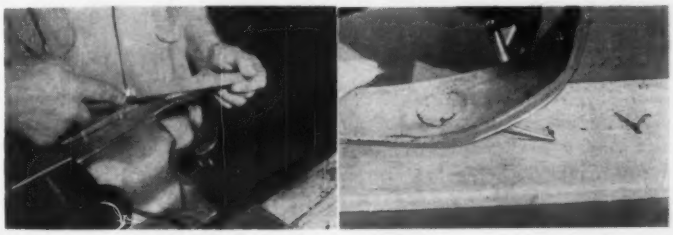
The Plane Test for Checking Gaff Sharpness



Place the climber with the point of the gaff downward and with the upper strap loop resting against the wood surface. Hold the leg iron with the stirrup vertical and the leg iron parallel with the wood surface.

Now push the climber horizontally along the surface in the direction of the gaff with the point of the gaff still in contact with the wood, as you would a carpenter's plane. Use no downward pressure except the weight of the climber. If the gaff point buries itself in the wood within a few inches and continued pushing will move it no further, the gaff properly sharpened.

If the gaff point merely slips, slides, or ploughs a shallow groove in the wood, it is *not* properly sharpened and should *not* be used until re-sharpened and successfully tested. See boxed instructions on p. 94 for sharpening gaffs.

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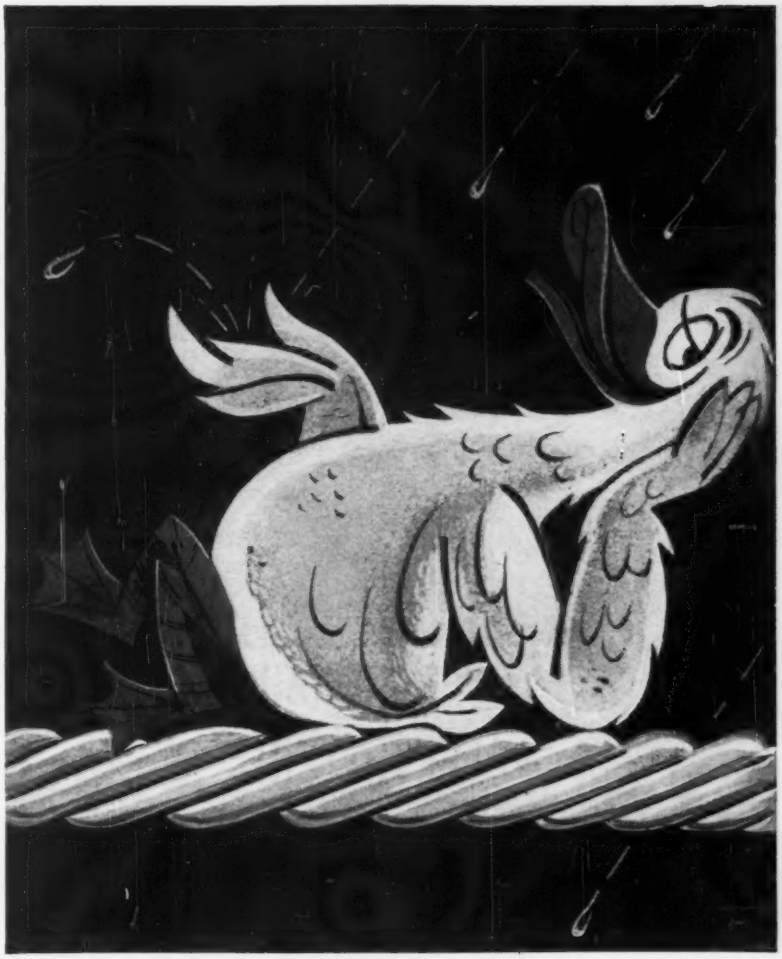

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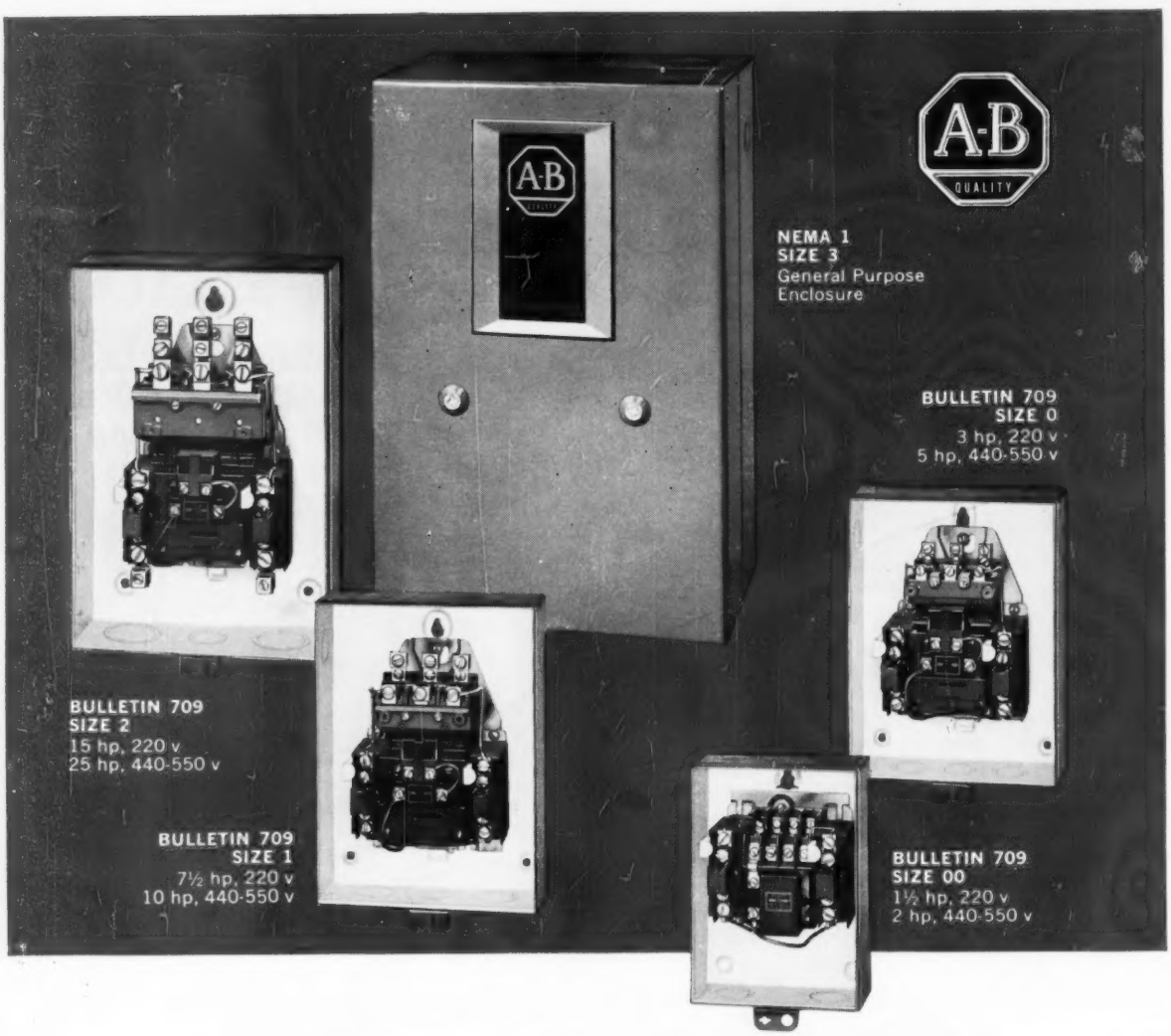


According To All Previous Standards...
These New Allen-Bradley Motor Starters Offer
MORE RELIABILITY AND LONGER LIFE!

The new Allen-Bradley solenoid starters bring an up-to-the-minute measure of performance to industry. While the previous A-B Bulletin 709 solenoid starter set its own mark of quality over the last 30 years, and was generally recognized as "the best control on the market," the new Series K line of solenoid starters leave the older model far behind. Rating for rating, no other starter equals their reliability and long life. They are good for *more* millions of trouble free operations than you'd think possible. And, with extra interrupting capacity "built-in," they are easily equal to any "job" they may be asked to handle within their listed ratings. Brooks Stevens, internationally famous industrial designer, has given the modern new enclosures a distinctive appearance that will add "eye appeal" to every installation. Please write for full details contained in Publication 6100: Allen-Bradley Co., 1327 South First Street, Milwaukee 4, Wisconsin.

ALLEN-BRADLEY Member of NEMA **Quality Motor Control**

CARAVAN ready for road, includes a Chance hot-stick trailer and a Pitman aerial platform on a special body

IDEAS discussed during conferences with utility personnel will be tried out at special field sessions

Caravan To Research Live Line Maintenance

A research caravan, a joint venture of the A. B. Chance Co of Centralia, Mo., and the Pitman Manufacturing Co of Grandview, Mo., will do on-the-job studies of utility line maintenance in cooperation with the nation's electric light and power companies.

N. A. Toalson, president of Chance, and R. F. Pitman, president of Pitman, issued a statement that the caravan's purpose is "to cooperate with utility companies to determine the best methods of performing maintenance tasks on all types of construction, all types of structures, and all voltage ratings. Our aim is the development of maximum job productivity consistent with maximum safety." They said the field research activity would also lead to the development of new tools, equipment and techniques in line maintenance and line construction.

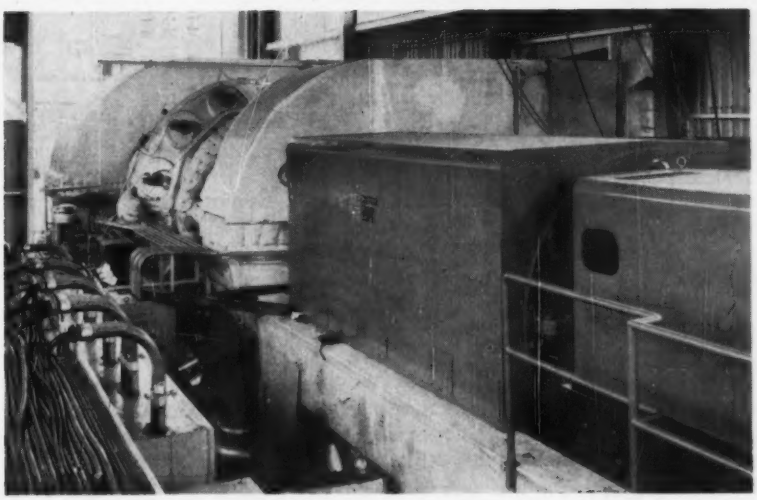
The Chance-Pitman research caravan consists of a fully-equipped 50-ft Pitman aerial platform with fiberglass bucket, and a trailer of Chance "hot line" tools, both power and manual devices.

It is expected that the caravan, starting out in November, will cover approximately 40,000 miles and work with utilities throughout the country in 1962.

As the research progresses at each site, a detailed procedure will be prepared for each maintenance job if existing equipment can be efficiently and safely matched to it. Where unusual problems occur, the information will be sent to the engineering departments of Chance and Pitman as a guide in equipment changes and new product design.

The caravan manager is Don Collins of A. B. Chance. O. G. Anderson, tool product manager for Chance, is arranging the caravan's schedule which is still incomplete.

22-Mw Gas Turbine for Philadelphia Electric



The 22-Mw gas turbine for base or peak-load electric power generating duty, reportedly the largest in the US, has been placed in service by Philadelphia Electric Co at Barbadoes Island, near Philadelphia.

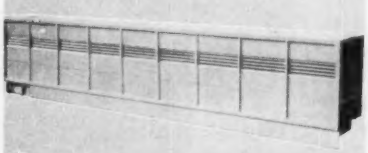
Built by Westinghouse Electric Corp's steam division, the gas turbine is completely remote-controlled with all of the starting, synchronizing, loading and stopping functions performed from the Barbadoes Island station's main control room, some 200 yd away.

R. C. Twombly, manager of the Westinghouse small steam and gas turbine department, said, "This station is designed as a minimum cost power plant for unattended opera-

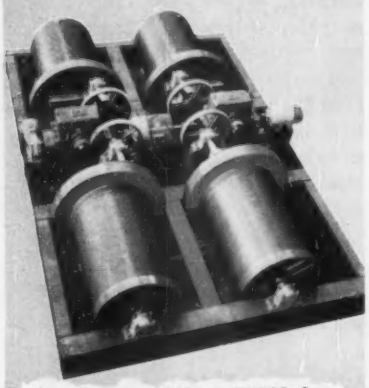
MURCO GATE HOISTS

designed to meet your requirements

MURCO Gate Hoists are designed and made for any size power dam . . . capacities from less than 1 ton to over 375 tons . . . from the smallest hand operated to the largest motor operated gate hoist, all made to specifications.



For the second largest hydroelectric power plant in the United States at Massena, New York — as part of the St. Lawrence power project — Uhl, Hall & Rich, project engineers, selected MURCO Gate Hoists to control the water level at Long Sault Dam.



One of the two 380-ton MURCO Gate Hoists furnished to the Power Authority of the State of New York. Each hoist operates a gate 46' wide by 67' high at one foot per minute. These gates divert the water from the Niagara River above the Falls into covered conduits five miles long.

Write for complete information . . . Engineering Department recommendations . . . when you are planning power dam projects.

D. J. MURRAY MANUFACTURING CO.

Manufacturers Since 1883

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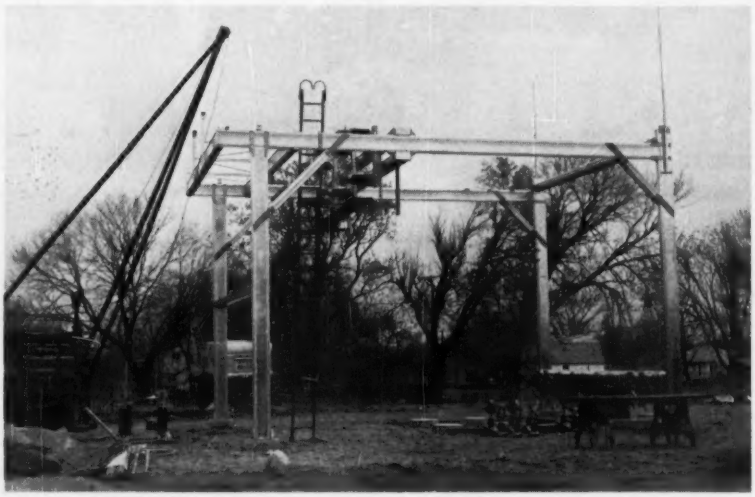
tion. A side inlet and side exhaust on the turbine permit low cost foundation and minimum building height. A smaller frame-size generator is made possible by employing the hollow-core concept.

One feature included for peak-load duty is the elimination of cooling water and the attendant corrosion problems during extended periods of idle time when the machine is not required. The lubricating oil is cooled by an air-to-oil cooler, and the generator is an open air-cooled type. The turbine burns either natural gas or fuel oil.



FIRST ALUMINUM SUBSTATION USING BOX-TYPE TRUSS MEMBERS and a new method of making bolted joints is erected by Consumers Power Co.

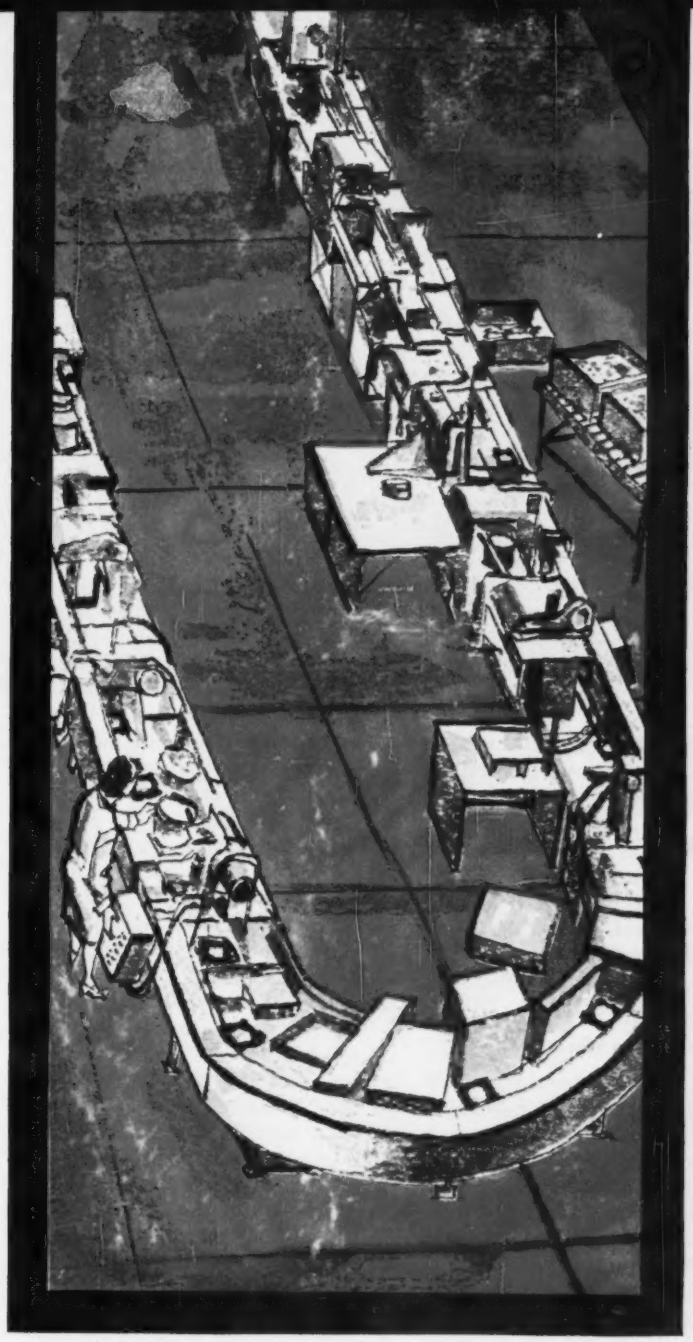
Alrectic Develops Unique Substation

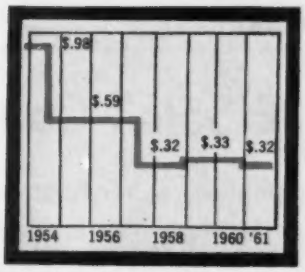
The first low-silhouette distribution substation utilizing box-type aluminum members and a new method of making bolted joints was unveiled by Alrectic Div, McGraw-Edison Co, at Alto, Mich., just before *Electrical World* went to press. Erection of the structure as a permanent substation for Consumers Power Co was witnessed by 41 representatives of 12 midwestern electric utilities and two engineering firms. The complete structure was put up by a Consumers Power crew with standard tools and equipment.

Designed and fabricated by Alrectic as an attractive, lightweight and flexible substation for urban areas, the structure embodies two distinctive features. The first is the "Dynabeam" box-type truss, consisting of extruded aluminum chord members and aluminum side plates that replace lacing members. Plates are compression-joined to chord members, not only to carry shear forces but also to function in the section modulus. These members, plus connection plates, are of 6061-T-6 aluminum alloy.

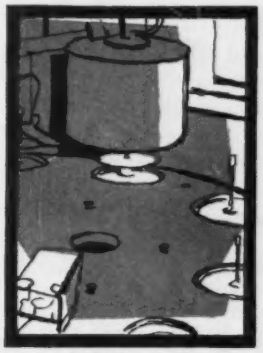
The structure for Consumers Power's two feeder distribution substation measures 30 ft long, 21 ft wide and 19 ft high over-all. It consists of 6x12-in. columns, 6x12-in. trusses and beams, one 12x12-in. beam, and 6x6-in. braces. It is designed for 1,000-lb tension per conductor on the 46-kv side and 500-lb tension per conductor on the feeder end. Total weight of the structure is about 1,500 lb. Total cost of the structure as "laid-down" to Consumers Power was given by Alrectic as about 90¢ per lb.

The structure was partially assembled on the ground, including bolting of racks and attachments for equipment onto main members, before being raised and bolted together. According to Alrectic, the "Dynabeam" member represents a 50% weight saving over welded laced aluminum members of equivalent strength. Laid-down cost of a 10-ft, 6x12-in. aluminum truss, weighing about 41 lb, is $39.60; on the same basis, a 10-ft 6-in. flanged steel I-beam weighing 200 lb would cost $40, Alrectic said.

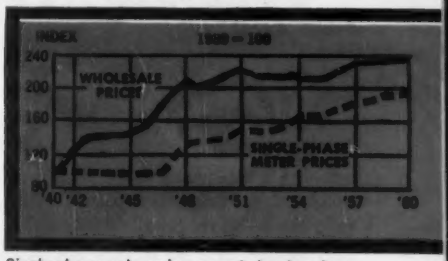




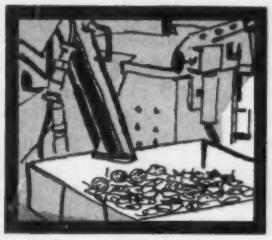
Single-phase meter prices per KVA of meter capacity



Rotary turntable used to magnetize inner suspension magnet on disk-shaft



Single-phase meter prices vs. wholesale prices



Die-cast worm gear to shaft in single automated operation

ANOTHER GENERAL ELECTRIC METERING EXTRA . . .

How automation helps keep meter prices low

The electric utility industry might have paid an additional $400 million for watthour meters during the last 21 years if meter prices had increased at the same rate as the 2000 other commodities on the government wholesale price index (see chart above).

Instead, meter prices have remained relatively stable in spite of rising material and labor costs. As recently as 1954, the price of a standard, 3-wire residential-type, single-phase meter, per KVA of meter capacity was 98¢; today, it has been reduced to 32¢ (see chart above); in 1923, the price per KVA was $20.35.

General Electric's integrated automation and other cost-reducing programs —aimed at offering maximum value for the customer's meter dollar—have been prime factors in helping keep meter prices low. Design leadership through magnetic-suspension, and quality leadership through certified accuracy, performance and reliability also contribute to maximum meter value. Get the complete "Meter Price Story" from your General Electric Sales Engineer. 713-13

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- Jet Stream Service
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- Application Assistance
- Product Service
- Load Building Programs
- Industry Communication
- Local Personalized Sales-Service

GENERAL ELECTRIC

SEE Sales Conference Ponders Four Areas

Competition, water heaters, appliance servicing, and rural electrification come in for most attention at Southern meet

The problems that were bothering the Southeastern Electric Exchange last year are still a matter of concern to it. That is competition and water heaters. To these, however, is now added appliance servicing and rural electrification.

These four subjects seemed to garner most of the attention from speakers and at poolside discussions, at the SEE Sales, Advertising and Public Relations Conference Nov. 15-17, at St. Petersburg, Fla.

"What about competition?" asked B. G. Campbell, vice president-marketing, Consumers Power Co.

"Natural gas is a good fuel," he said. "It isn't dirty, it isn't slow in performance, it isn't expensive, and it doesn't blow up in your face every time you use it."

And the natural gas industry has made dramatic progress, he pointed out. In the 1950's nearly 10 million residential customers were added, sales more than doubled to 88 billion therms and $5 billion per year, mains were extended to a total of 30 million homes, plant investment more than doubled to $20 billion, the number of residential heating customers trebled, and over 9 million appliances were sold in 1959.

During the 1960's another 10 million residential customers will be added, 300,000 miles of gas mains will be installed, plant investment will exceed $45 billion, and by 1970 150 million gas appliances will have been sold.

But the electrical industry doesn't need to lose its share of the business. "It too has ambitious plans," Campbell said, referring to the *Electrical World* forecast (EW, Sept. 19, 1961, p 105-120) which stated that total sales will increase from 714 billion kwhr in 1961 to 984 billion in 1965, and 2,914 billion in 1980.

The competition between fuels is not between gas and electricity opined O. J. Miller, SEE president and executive vice president, Duke Power Co. "Competition in this case is rather one of salesmanship. Comparison of the two products confirms the superiority of electricity for heating, cooling, and lighting."

But spending more money on promotional activities is not the only way to get the job done, he said. Quoting a statement made by the North Carolina Utilities Commission, Miller said, "Sound competition by and among utilities should be founded upon efficiency of management techniques, productive skills, technological improvements, superiority of service, and economy of costs to the consumer, more so than upon high promotion expenditures."

A major problem of sales people is that of evaluating the effectivness of the dollar spent for sales promotion, Miller said. "At present we are unable to determine to what increased promotional work contributes to revenues."

Watch Operating Efficiency

While entering into a period of increasing competition it is essential that utilities continue to keep a watchful eye on operating efficiency and economy, Miller said. "Our success in financing future construction programs will depend upon our ability to hold our favorable position in financial competition with other growing industries."

What SEE utilities are doing to promote the quick-recovery water heater was reported by C. W. Carroll, director of residential and rural sales, Virginia Electric & Power Co.

Of the 19 companies, 13 promote the 40-gal water heater, two the 50-gal. Of these 19, seven sell heaters, while at 16 companies the units are sold by trade allies. "The best trade allies for water heaters are the appliance dealer, plumber, and builder-dealer," Carroll said.

He then called for more effort on the part of manufacturers to promote quick-recovery water heaters in advertising, "to help capture a greater share of this market."

The "big three" are still important in the promotion picture, advised General Electric Co's Manager of Residential Market Development, George T. Bogard. The big three are ranges, dryers, and water heaters.

For water heaters Bogard pointed out that "One would think that electric utilities would find a way to get them into the homes even if they had to give them away". While there were a million electric water heaters sold in 1947 and 1948, in the last full year only 700,000 were sold. "It's probably just a question of time until the only electric water heaters sold are those in Gold Medallion Homes, or on farms not connected to a gas distribution system".

The water heater is one major appliance the public cannot be made to believe is better because it is electric, according to Bogard. If consideration is given to installed cost, operating cost, and performance, what superiority can electric claim? he asked.

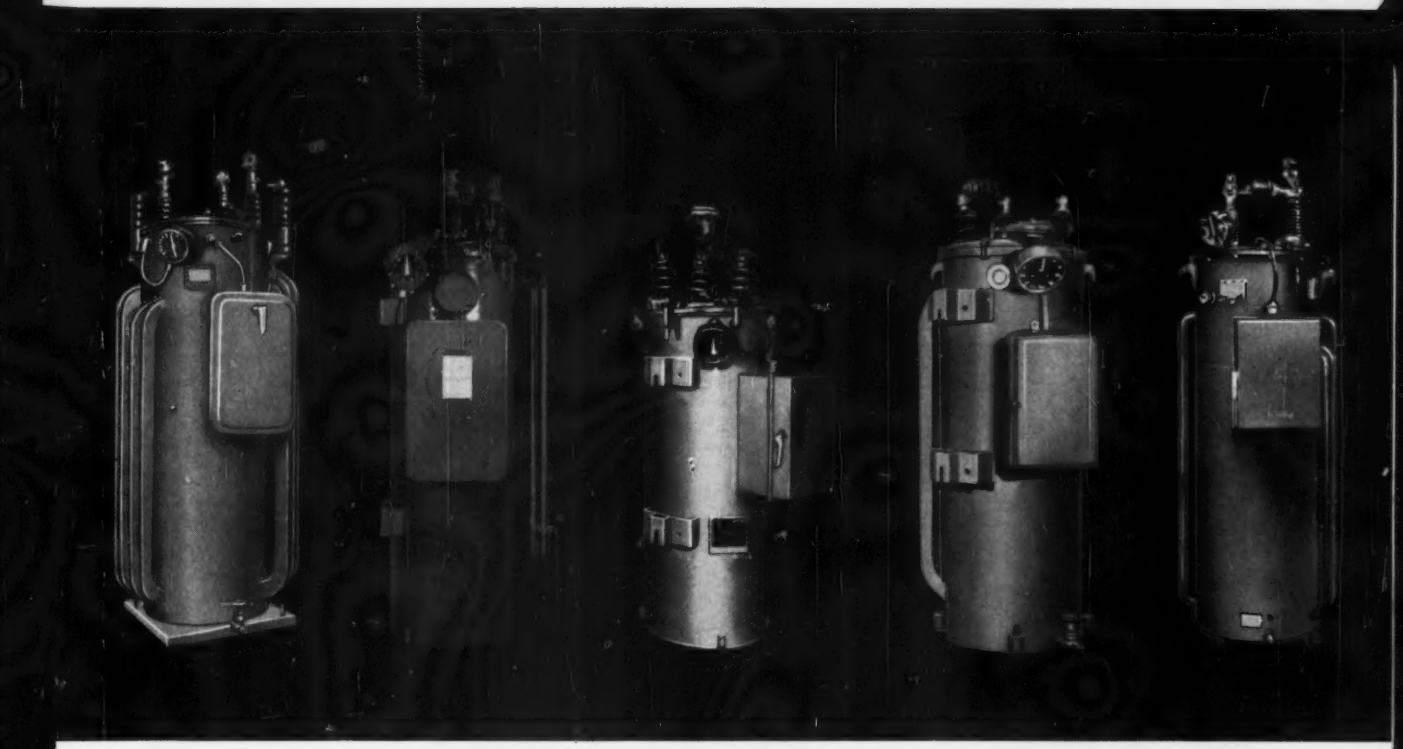
The only way electric water heaters will beat gas is when the electric utilities start selling "Hot Water Service," Bogard suggested. Provide the water heater and make the complete installation without charge to the customer, charge 1¢ per kwhr on a block rate, add a $2 per month flat charge to liquidate the cost of the water heater and the installation.

"Only then will there be a fighting chance to achieve spectacular gains in the replacement market," the GE man said.

The appliance service problem is a major one. If through some fault or breakdown of a great number of appliances, or through the increasing charges of appliances servicing by dealers or independent servicing organizations, utility customers do not have their appliances repaired, the loss of kwhr could be substantial. This was the warning of Malcolm R. Rodger, vice president sales, Middle West Service Co.

"It may also force many customers to purchase gas appliances rather

(*Continued on page* 110)



ALL REGULATORS ARE ALIKE

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IN THE AREAS OF . . .

ACCURACY—Bandwidths of ±¾ volt are possible with the G-E type ML-32 regulator. Why: 32 steps, plus unique Micro-Band* calibrated relay.

LIFE—General Electric regulators are designed to exceed the service life of competitive units. For proof, compare the life expectancy data published by G.E.

ADJUSTMENT—G-E regulator controls are easily adjusted *without voltmeter juggling at pole-top*, by means of dialable voltage level and bandwidth settings. Micro-Band calibrations give micrometer accuracy in 10 seconds (or less).

FEATURES—G.E. eliminates marginal gadgetry. Costs go into truly beneficial features, such as switch strength, internal Thyrite® bypass arresters for more even voltage distribution, and plug-in controls for speedy inspection.

MAINTENANCE—No need to untank G-E regulators for periodic inspection of contacts. Why: electrostatic shielding and Opti-Life switching are features of *all* G-E step regulators.

SERVICE—48-hour emergency shipments of parts is just one of the many extra conveniences available from General Electric's nation-wide network of service facilities on an around-the-clock basis.

FOR ALL THE REASONS WHY G-E regulators are your best Total-Value Buy, contact your General Electric regulator representative. Or, write General Electric Company, Section 456-9, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

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Progress Is Our Most Important Product

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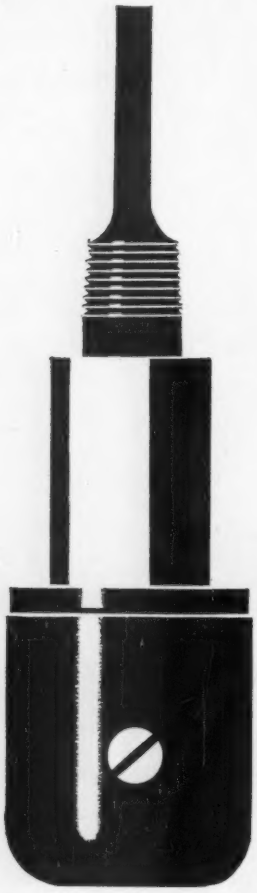

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THERMOCOUPLES

Honeywell's new line of hard-pack, small-diameter, mineral-insulated thermocouples. Available as bulk material (combination of wires, insulation and sheath); elements (with measuring junction); and as complete assemblies (with terminations and mounting attachments). From this one dependable source come thousands of other accessories to make your instruments perform at their very best.

Get details from your Honeywell field engineer, or write today for Catalog G100-4.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

Honeywell
First in Control

Selling (*Continued from page* 108)

than electrical because gas utilities are more actively engaged in actually servicing gas appliances. In many instances the gas utilities service their customers' appliances at lower cost and in some areas at no charge for parts or labor," Rodger pointed out.

Yet the electric appliance industry and the utilities' concern for their customers' satisfaction has never been greater.

Appliance service is big business, Rodger, said. Somewhere in the neighborhood of $4 to 5 billion annually. And customers are paying two-thirds as much for servicing their appliances each year as they pay for new appliances. The average annual appliance service cost per customer is between $75 to 95 annually, he pointed out.

Less Service Time Now

On the plus side, however, one company has found that the 1960 model requires 45% less servicing than a model ten years ago, and it takes 10% less time to service an appliance today than a decade ago.

Appliance dealers surveyed said they should do the servicing. Only six thought the utility should.

But if they are not going to service, what can they do?

1. Encourage customers to call franchised dealers.

2. Encourage dealers to take advantage of training programs.

3. Continue promotion of adequate wiring.

4. Stress good wiring and proper voltage at the appliance, thus adding longer life to component parts.

Farmers may splurge on luxuries for the home, but spurn them if they run up the cost of making a living. The first rule of developing farm load is work in the farmer's interest. The second is to raise the quality of service. "As automation increases, voltage regulation and uninterrupted service will become more critical for the farmer. It will be important to locate transformers close to the load centers on the farm and to take other steps which will mean better electric service."

These were the views of Richard A. Dell, deputy administrator, Rural Electrification Administration.

Farmers and other rural residents will continue to use more electricity," Dell noted. The cooperatives can also expect to gain new population, new industries and institutions through normal growth. So the cooperatives will need even more power in the future, he commented. "By 1970 we anticipate that the input of our systems will be 70 billion kwhr; by 1980 140 billion. And by 1985, around 200 billion."

REA borrowers are in the business to stay and, like good business people everywhere, they are going to do business with those who offer reasonable terms, Dell said.

Don't oppose rural electric systems, he urged. "If you look at the future load growth possibilities, it doesn't make good sense to handcuff a good customer."

Make farm sales a primary objective, not a secondary one, was the advice of C. L. Osterberger, vice president and sales manager, Louisiana Power & Light Co. "We have only scratched full potential of the farm market," he said. "There are over 300 practical uses of electricity on the farm. National average farm usage is now 4,000 kwhr per yr. This is only 1,000 kwhr more than that of the national average residential user. Farm consumption should be around 15,000 kwhr per farm by 1975, and American farmers will buy, or could be induced to buy, $1 million worth of farm equipment during the next five years."

Footcandles, or lighting, is almost a lost art with many utilities and when a movement to the "all-services approach" was made a number of years ago, the "pure lighting department" began to disappear.

Today, however, there is a renewed interest in lighting and it is growing steadily. So said, Georgia Power Co's sales manager, Joe B. Browder.

Local heating codes may not recognize, or permit credit, for lighting heat and may require a separate heating system, Browder pointed out. He suggested some educational work with the building code people to get this changed in order to take full advantage of "the fabulous possibilities offered by heating with light."

Get ready for winter now

with Bethlehem Strand

Service interruptions were frequent and costly in many areas last winter. Snow and ice, broken limbs, and falling trees caused great damage to conductors and messenger strands alike.

When you use tough, strong Bethlehem strand as a messenger, you'll keep outages to a minimum. Bethlehem strand has exactly the right properties:

1) *High tensile strength.* Bethlehem strand is made in five grades, through Extra High Strength, to take care of all strength requirements.

2) *Good fatigue properties.* Fatigue tests show that bethanized wire is second to none.

3) *High resistance to corrosion.* Bethlehem offers 4 weights of bethanized (electrolytically applied zinc) coatings, as well as Bethalume (hot-dipped, aluminum-coated) strand for use in highly industrialized locations.

For complete information, call the nearest Bethlehem sales office.

Steel *for Strength ... Economy ... Versatility*

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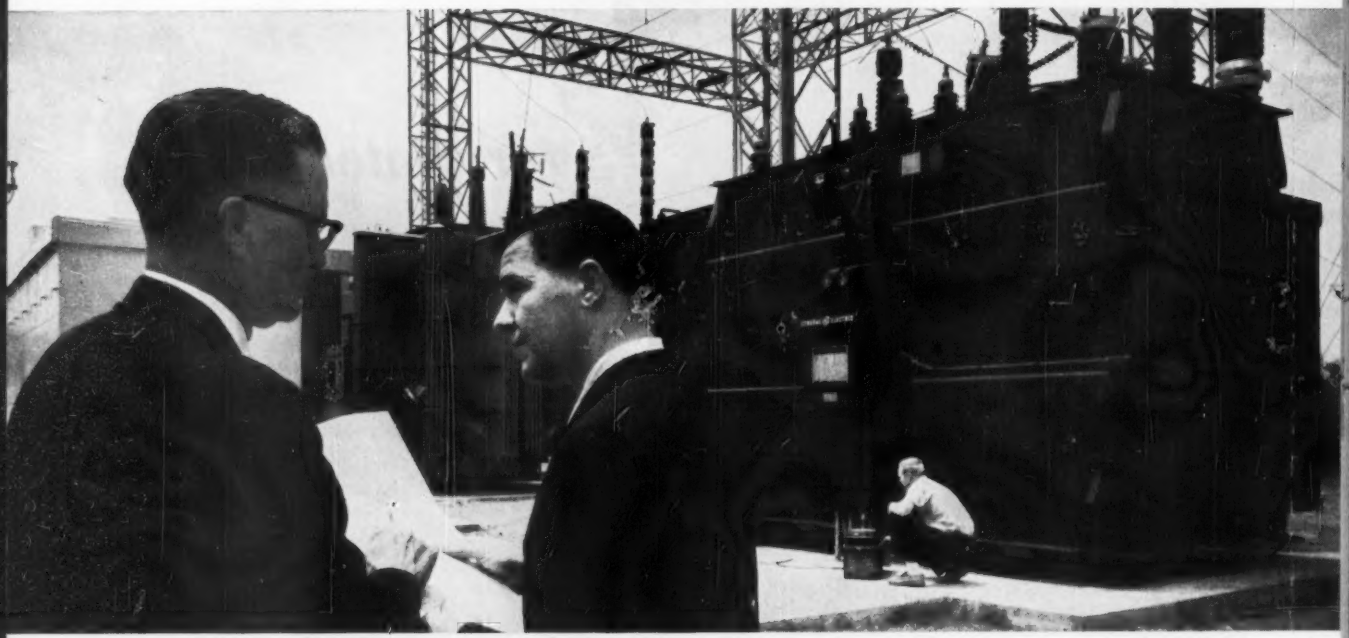
Export Sales: Bethlehem Steel Export Corporation *Distributor:* Joslyn Mfg. & Supply Co.

BETHLEHEM STEEL

BETHLEHEM STEEL

Operating and Maintenance Superintendent O.L. Hughes (left) of Mississippi Power and Light and J.W. Stone of General Electric compare 1958 Preferred Design Transformer (rear) with 1961 low-height unit.



CUSTOMER FEEDBACK: keeping the "Preferred" in Preferred Design Transformers

Feedback from sales engineers' calls similar to the one above and from 32 special utility meetings held last year has helped General Electric provide power transformers with the latest customer-preferred features:

- Large substation units rated up to 25,000 kva are now 40 inches lower than previous designs, to solve bridge clearance problems.
- Permalex® transformer insulation, which permits operation of units at 65C rise with 12% more continuous capacity and normal life expectancy, is now standard on low-height units.
- Extended ratings for generator step-up transformers increase the upper limit of the Preferred Design line from 250,000 to 400,000 kva.

These and other changes—redesigned cooling equipment and a sealed-tank oil-preservation method on the new low-height units, for example—are the results of a continuing responsiveness to utility needs. Such responsiveness has been the basis of Preferred Design since the concept (first announced in 1957) grew out of a nationwide survey.

To learn how you can benefit from this combination of customer-preferred features and product uniformity, call your G-E Sales Engineer or write to Section 604-17, General Electric Company, Schenectady 5, N. Y., and ask for bulletin GEA-6604B.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Electrical World

DECEMBER 18, 1961

Management Newsletter

Appliances Are Moving Again

Electric appliance dealers are blowing the dust off their showroom washers, dryers, and freezers. After two years of inactivity, the customers seem to be coming back again. And the outlook for appliance sales hasn't been so promising since the boom of 1959.

In '59, appliances and home electronics set a record. White goods sales reached $6.17 billion. Radios and television sets added on another $1.76 billion, and phonographs accounted for $600 million. If we group all of these together as appliances, which, strictly speaking, they're not, the total volume for the year was $8.44 billion.

But during 1960 and the first half of '61 consumer interest in appliances waned a bit. Sales were off month after month, and when the 1960 figures were totaled it was only a $7.89 billion year, 6.5% below the '59 record. The first half of '61 looked even worse, and the dust in the showrooms began to accumulate. But during the past few months, the consumers have come out of hiding. Appliance sales have picked up briskly, and the word from appliance manufacturers is that 1961 will be at least as good as '60, and perhaps even a little better.

While '61 is finishing in such fast form, the outlook for 1962 is improving steadily. At a speech before the AFL-CIO last week, President Kennedy was able to announce a significant cut in the nation's unemployment. From October to November, the seasonally adjusted rate of unemployment fell from 6.8% to 6.1%. High unemployment can be a barrier to consumer confidence, and perhaps the improved situation in this area will make consumers more willing to part with their dollars.

Consumer income has been rising steadily. Disposable personal income rose from a first quarter level of about $354 billion to a third quarter total of nearly $368 billion. This means that the buying power is there, and that if it is coupled with increased consumer confidence, it should mean stepped-up demand for appliances.

In addition, the housing industry is showing signs of life. A year ago, houses were going up at a seasonally adjusted annual rate of 987,000 units. But that figure has improved throughout the recovery. In October, it had reached the surprising level of 1.44 million new units a year—still not rivaling 1959's record, but nevertheless most encouraging. New homes are, of course, a prime target for appliance sales.

Meanwhile, appliance manufacturers aren't standing idle and waiting for the upswing to improve their business. They've packed their new units with extras designed to give their salesmen something to crow about. Modern washers, for example, have a better selection of speeds enabling them to handle the full range of washable items. Even women's stockings can now be done automatically. And clothes dryers do more than dry clothes. One model comes with an attachment that converts it into a professional looking women's hair dryer. These and other extras should help the showrooms to ring up replacement sales.

Putting all these factors together, 1962 promises a healthy increase over '61. The outlook now is for '62 sales of about $8.2 billion, up more than 3.9% over 1960, about 3.5% better than reasonable estimates for 1961, and only 2.8% below 1959's industry record.

Utilities have a double interest in the success of the appliance industry. Besides the stimulant that appliance sales provide to industrial activity, the dryer or dishwasher is a money maker for the utility long after it's been produced and sold. As long as it's connected to utility lines, it's adding residential or commercial sales.

How much is it adding? The amount of electricity used by household appliances varies from about 65 kwhr annually for an automatic clothes washer to better than 4,000 kwhr a year for an electric hot water heater. A standard refrigerator with a freezer compartment will use about 845 kwhr a year, while an electric clothes dryer burns about 960 kwhr.

But sales of new appliances don't always mean additions to residential load. In many cases, they're merely replacements for existing units. The number of replacement sales as opposed to new owner sales varies from appliance to appliance, depending on the saturation rate for the appliance.

Refrigerators, for example, have the highest saturation rate of any appliance. In 1961, 98% of the wired housing units had refrigerators. With this much saturation, it's not surprising to find that better than 70% of 1962's refrigerator sales will be replacements for units already connected to utility lines.

Certainly, the replacement may use more power than the older model. The customer may decide that his new refrigerator will be larger than the old

one. Or, he may replace the older unit with one that defrosts automatically or has a larger freezer compartment. All these factors will add to the amount of electricity he uses. But still, the additional power sales can't be as great for the replacement as for the sale of the same appliance to a new owner.

Dishwashers, on the other hand, have a saturation rate of about 7%. As a result, more than 85% of the dishwashers sold represent completely new demand for the utilities' service. In January, 1961, the saturation rates for typical household appliances looked like this:

Percentage of Saturation for Typical Appliances

Air Conditioners	15.1	Standard Ranges	29.2
Dish Washers	7.1	Refrigerators	98.0
Clothes Dryers	19.6	Televisions	89.4
Home Freezers	23.4	Washers	95.4
Portable Heaters	29.2	Water Heaters	18.9
Food Waste Disposers	10.5	Radios	94.3

As the table indicates, utilities are far more interested in the sales of some household electric appliances than they are in others. In addition, the low-saturation appliances are generally the ones that use the most electricity. Compare the high usage (960 kwhr annually) of the low-saturation dryer with the modest usage (65 kwhr annually) of the high-saturation washing machine. Similarly, the electric refrigerator uses less than one fourth as much power as the electric hot water heater. The outlook for these low saturation appliances is, therefore, much more meaningful to the utility than the outlook for appliances in general.

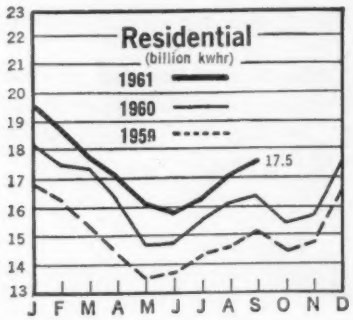
Preliminary estimates from manufacturers and dealers show a mixed pattern for sales of these "key appliances" in 1962. The industry generally expects that dishwashers will move very well in the coming year with sales about 10% higher than 1961. Food waste disposers and electric ranges should also enjoy good years. Both are expected to show increases slightly above the gains expected for all appliances. Dryers may well post the same increase over this year as is expected for appliances in general—in the neighborhood of 3.5%.

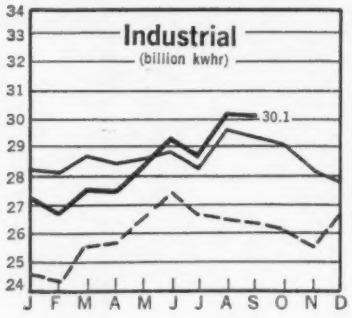
Electric food freezers are expected to be down by about 3% from the current year. This may be the result of a consumer preference for refrigerators with large freezer compartments built in. Estimates put refrigerator sales up 5% over 1961. Hot water heaters, like freezers, figure to be off in 1962, perhaps by as much as 3%.

But these estimates are only preliminary. It's important to note that most of these low saturation appliances are still considered, even by people in the industry, to be luxury items. The consumer will scrimp and save to buy a refrigerator or a clothes washer because they're considered to be necessities. But this isn't true for a dryer or dishwasher. Here the clothes line and the dishpan fill the bill.

We would, therefore, expect to see sales of the "luxury" appliances pick up rapidly when consumer income is high, and consumer confidence is strong. And this seems to describe the general economic outlook for '62. So, if the preliminary estimates do change, it may well be toward higher sales.

Monthly Sales of Electricity . . . through September





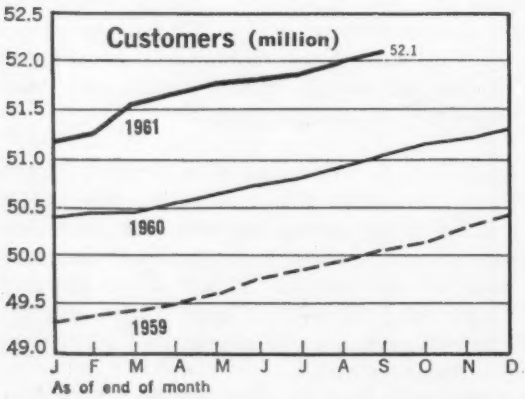
SOURCE: EDISON ELECTRIC INSTITUTE

Power Statistics . . . through September

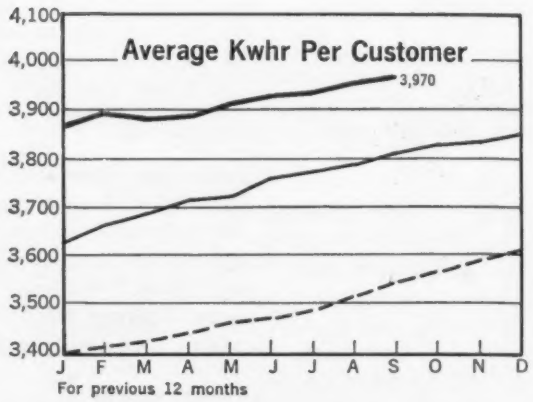
	Latest Month	Year Ago	Annual Change %
Capacity..... million kw.....	177.65	164.51	8.0
Production..... billion kwhr.....	67.30	62.58	7.5
Hydro.....	11.93	11.44	4 3
Fuel.....	55.37	51.14	8 3

SOURCE: FEDERAL POWER COMMISSION

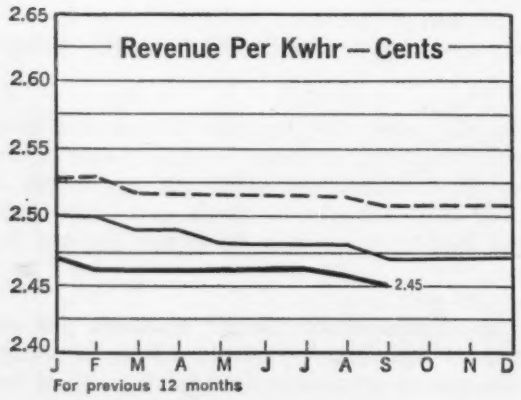
Residential . . . through September



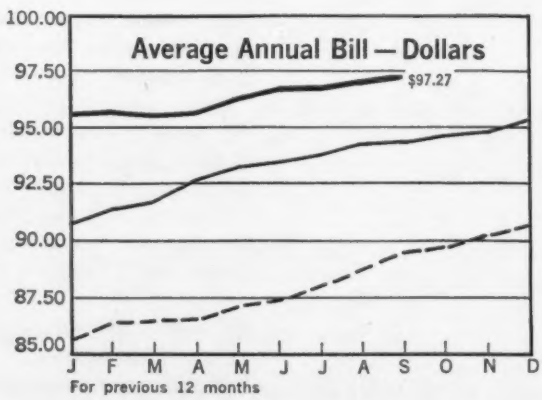
As of end of month



For previous 12 months



For previous 12 months



For previous 12 months

SOURCE: EDISON ELECTRIC INSTITUTE

This Transducer can save more than it costs

New Westinghouse Teleductor

Here is a simple, accurate and safe transducer which transforms a-c voltage or current into d-c millivolts or milliamperes to operate recorders, controllers, telemeter transmitters and supervisory equipment. It brings you savings that can add up to more than its cost — eliminating switching of instrument transformers, and permitting use of small-gauge wires to instruments.

The Teleductor* can also be used by itself as a simple and economical telemeter transmitter where a d-c line circuit is available.

The Teleductor protects people and equipment when current transformer secondaries are accidentally open-circuited. Prevention of one accident would pay for the Teleductor many times over. Load on current transformer remains practically constant when teleductor output is open-circuited.

Accuracy — nominally within 1% over full range with wide variations in output loading and ambient temperature.

Convenience — small size, easily mounted in any position. Dimensions are 4¼″ x 3$\frac{3}{32}$″ x 3⅛″.

Linearity — output is linearly proportional to current or voltage input.

Reliability — no moving parts or vacuum tubes. Basic element is cast in epoxy resin to resist moisture, shock and vibration.

For further information on the new Teleductor, contact your Westinghouse representative or write for Catalog Section 56-526 to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

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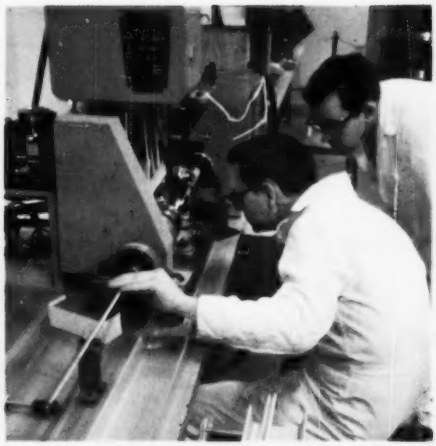
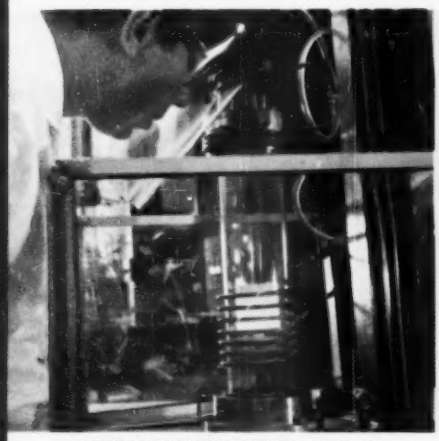
Westinghouse has all these commercial atomic power facilities

ATOMIC EQUIPMENT DEPARTMENT. Produces canned motor pumps, nuclear reactor valves and control rod mechanisms. Westinghouse pioneered these products.

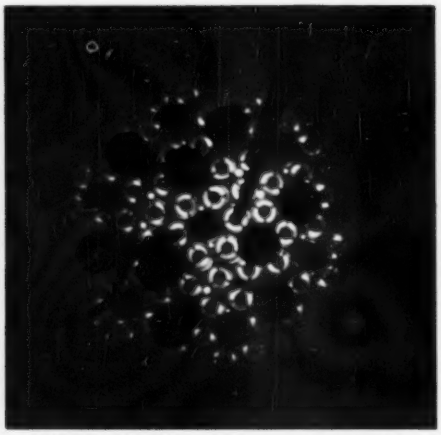
COMPUTER CENTER. This IBM 7090 computer is the latest addition to one of world's largest computer centers for advanced scientific-commercial data processing.



ATOMIC FUEL DEPARTMENT. Completely equipped, integrated fuel fabrication facility. Products include complete cores, fuel elements and control rods.

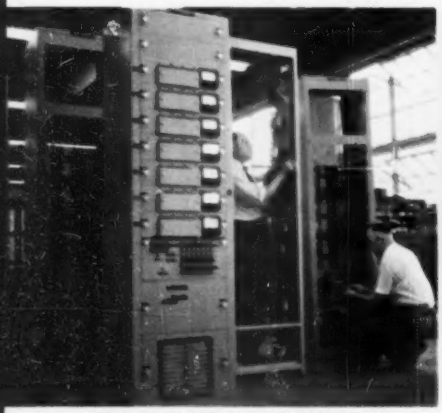


RESEARCH LABORATORIES. Westinghouse research has led to many important developments in nuclear science. Research is conducted by nuclear experts using advanced research facilities.

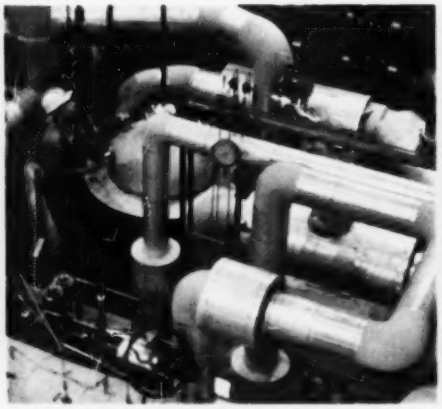


TESTING REACTOR. Most powerful privately-owned complete facility in United States. Nuclear fuels and other materials can be tested in reactor environment.

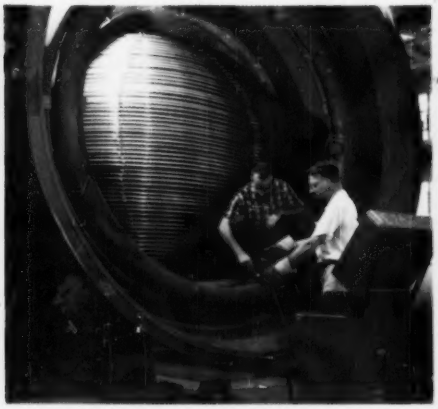
METALS RESEARCH FACILITY. Westinghouse provides complete pilot plant development work on metals, materials and equipment, under actual production conditions.



NUCLEAR CONTROL DEPARTMENT. Westinghouse control and instrumentation systems insure complete electrical compatibility in all phases of the nuclear power producing process.

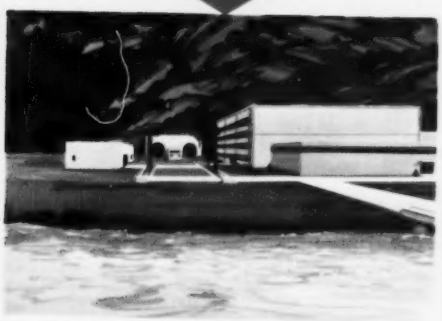


ATOMIC POWER DEPARTMENT. Here the work of thousands of Westinghouse employees is coordinated in the design and development of complete nuclear power plants.



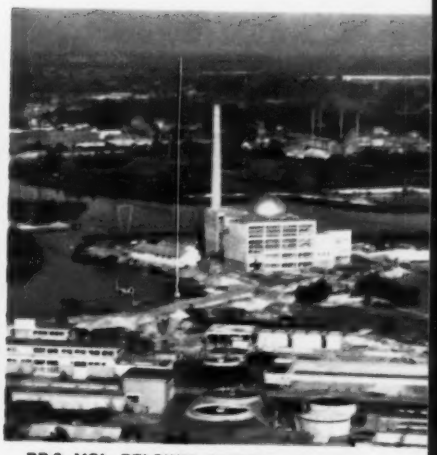
HEAT TRANSFER DEPARTMENT. Advanced designs and fabrication techniques employed in Westinghouse heat transfer equipment are major factor in efficiency and performance of Westinghouse nuclear power units.

and has designed or is developing the reactors for all these atomic power plants



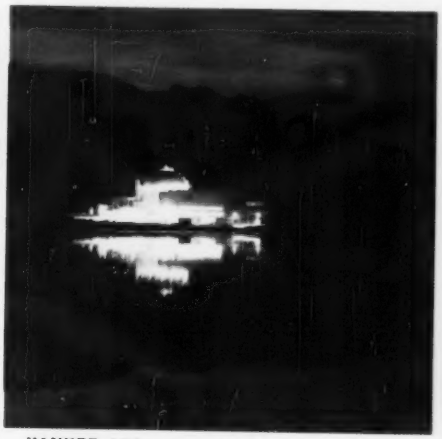
SENA, FRANCE. A 259-megawatt plant in Chooze, France, near the Belgian border (Artist's concept).

SAXTON, PA. An experimental water reactor to be used with an existing turbine-generator of the Pennsylvania Electric Company.

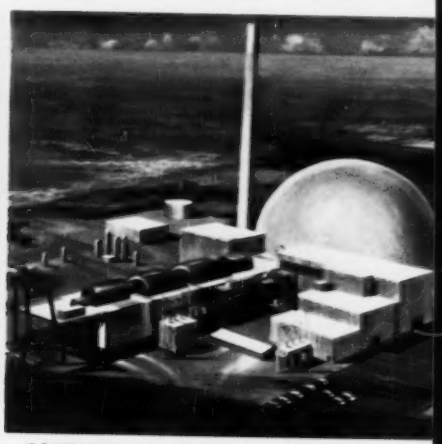


BR-3, MOL, BELGIUM. 11,500-kw plant for Centre d'Etude de L'Energie Nucleaire.

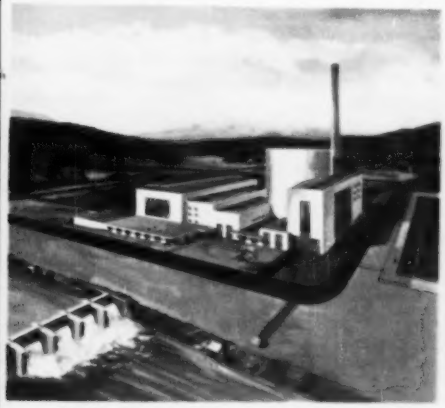
CAROLINAS-VIRGINIA. A 19,000-kw heavy water cooled and moderated pressure-tube prototype plant at Parr, S.C., for Carolinas-Virginia Nuclear Power Associates.



YANKEE. 150-megawatt plant for the Yankee Atomic Electric Co. at Rowe, Mass. New England's first atomic power plant is now producing electricity for the region's integrated power system.



SOUTHERN-CALIFORNIA-EDISON. 375-megawatt nuclear power plant proposed for Southern California (Artist's concept).



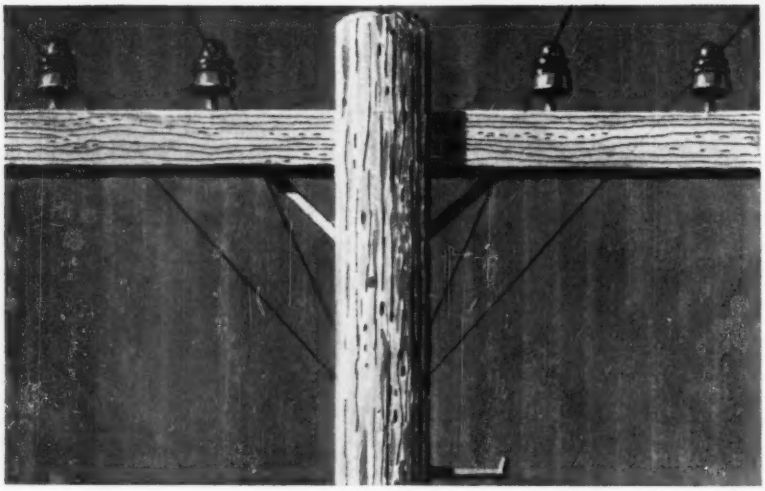
SELNI, ITALY. 186-megawatt advanced water reactor power plant for Societa Elettronucleare Italiana (Artist's concept).

SHIPPINGPORT, PA. Plant of Duquesne Light Co., the nation's first nuclear powered central station. Reactor designed by Westinghouse in cooperation with Naval Reactors Branch of the AEC.

JI-59505

Westinghouse

transporting men?



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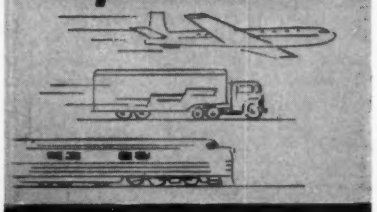

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You, in turn, can rely upon ***Crapo*** Galvanized Steel Strand, at all times, to give you the utmost in performance at reasonable cost.

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Phone the distributor of *Crapo* Galvanized Steel Strand near you the next time you need strand.

INDIANA
Steel & Wire Co., Inc.
Muncie, Indiana

J1-59505

Montana Power Names Corette Executive VP

Robert D. Corette has been elected executive vice president of Montana Power Co.

In this capacity he will exercise executive supervision over the rate, tax and legal departments and will be in charge of public affairs as well as general executive assignments.

Corette has been associated with the company since he graduated from law school at Montana State University in 1934.

◀ CORETTE

Toedtman Upped to VP at Blackburn

TOEDTMAN ▶

Jasper Blackburn Corp has elected John A. Toedtman, Jr., vice president in charge of research.

In this position, Toedtman will supervise all research, product design and quality control functions of the firm.

He joined Blackburn in 1946 and was named chief engineer in 1955.

He now serves on the Technical Committee of the National Electrical Manufacturers Assn Overhead Distribution Connector Group, and on the EEI-NEMA Joint Committee on Aluminum Conductor Fittings.

Canadian Firm Picks President and Vice President

Shawinigan Engineering Co, Ltd, has appointed R. E. Grout as president and J. A. Thomas as vice president-engineering and a director. Grout succeeded the late Guy R. Rinfret.

Grout joined Shawinigan Engineering in 1937 as a junior engineer. He was appointed senior electrical engineer in 1954, chief engineer in the electrical division in 1956, vice president and a director in 1960, and vice president-engineering this year.

Thomas, with Shawinigan Engineering since 1948, was named chief engineer in the civil division in 1956. He became a vice president earlier this year.

GROUT THOMAS

PERSONAL BRIEFS

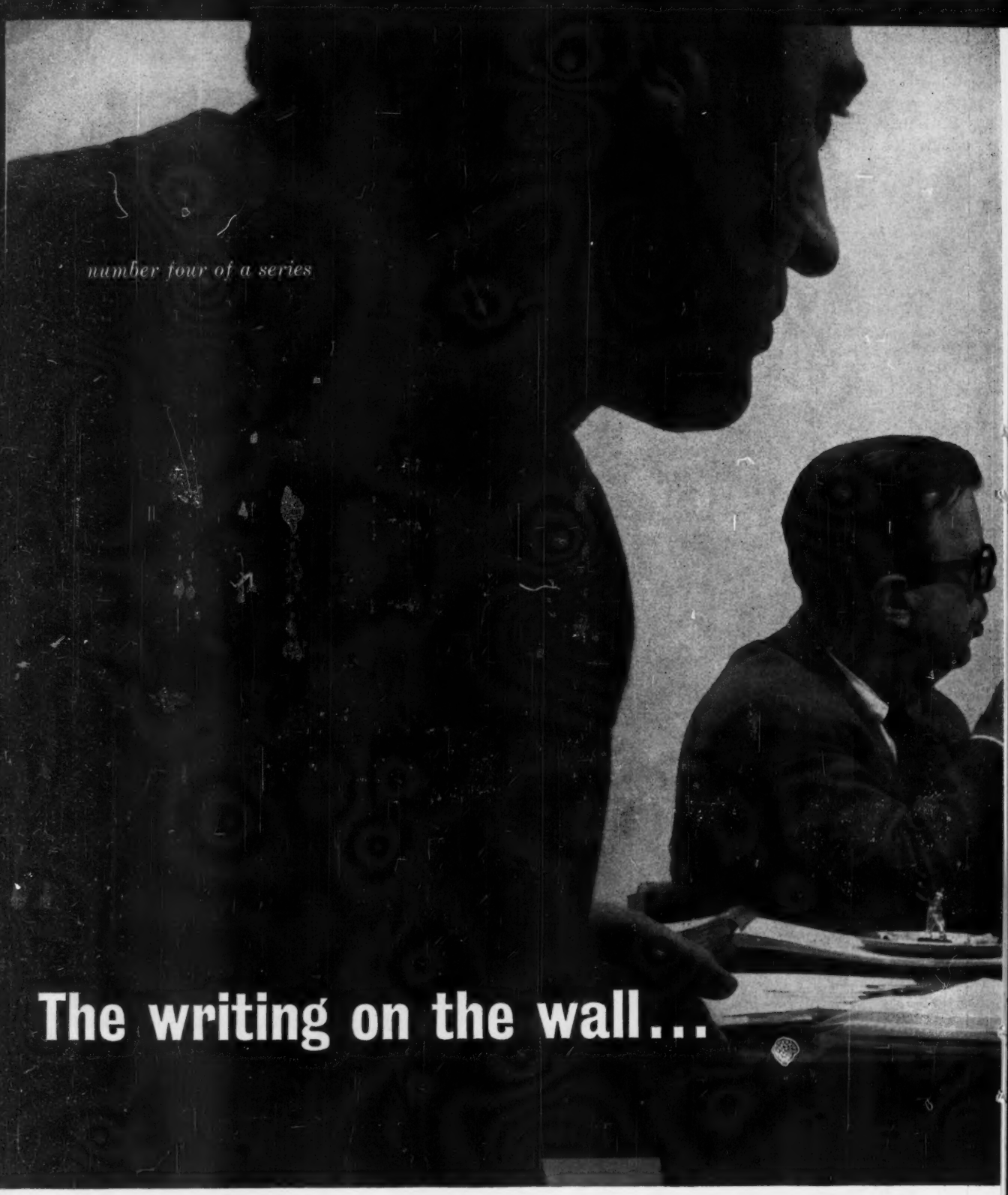
T. D. Thomas, vice president-engineering for Texas Power & Light Co, has been elected a fellow in the American Institute of Electrical Engineers.

Carolina Power & Light Co has named **Robert Lee Royster** as agricultural development engineer for the Raleigh district, and **Donald S. Morris** to a similar post in the Sanford district. **Gus H. Stewart** became manager of South Carolina area development.

Public Service of Oklahoma has promoted **Dale Stauffer** to computer application engineer and **Raymond Appleman** to assistant to the system engineering manager.

Dr F. Ralph Kotter has been named chief of the newly established high

(*Continued on page* 124)



Alert sales management reads the signs. Expensive personal sales calls must be made more productive to justify their cost—up 148%* in 16 years. By comparison, printed sales communication has increased only 67%**. Properly used, it sells harder than ever. Here's how the two, together, can hold a lid on your total selling costs...

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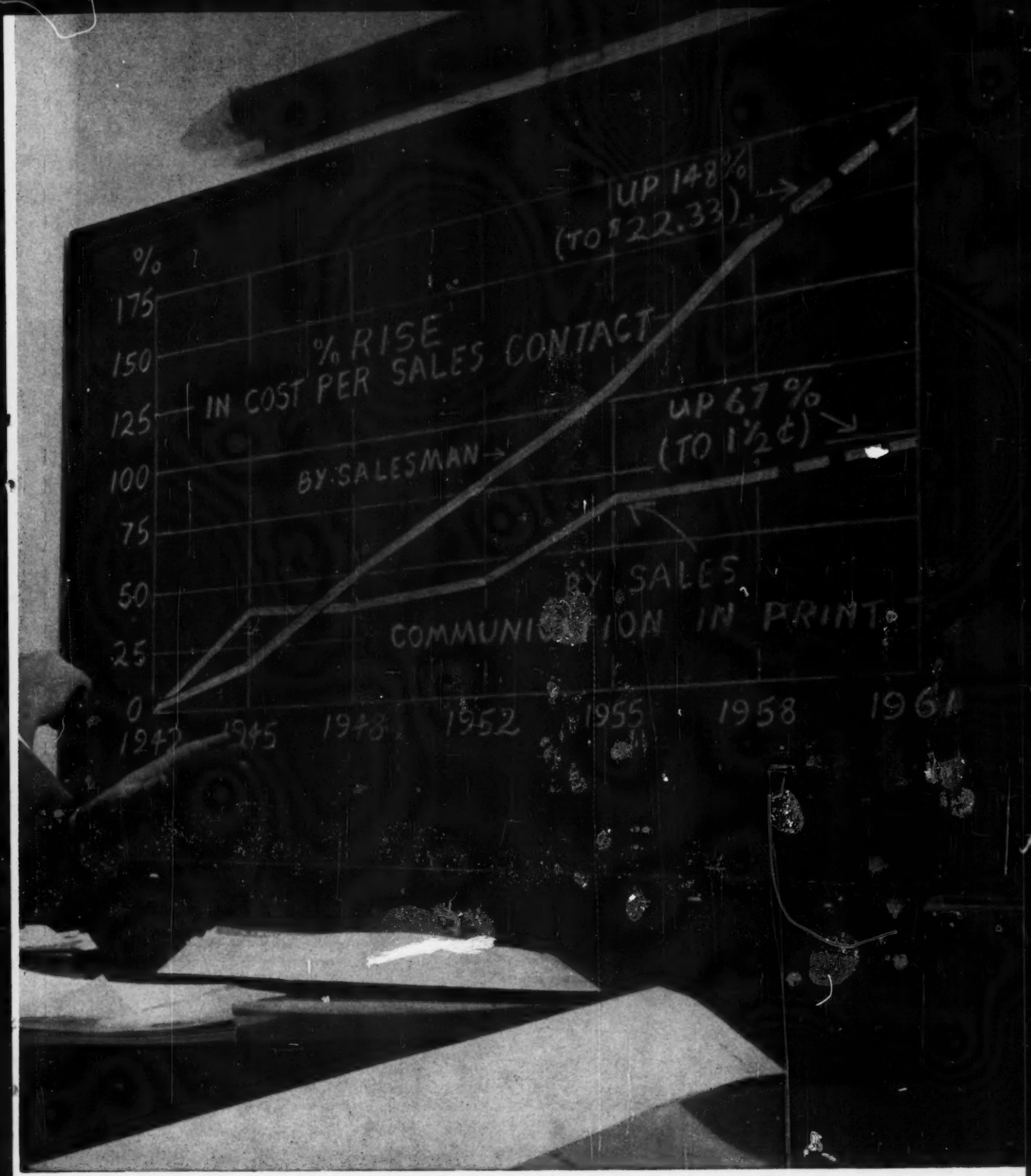
Sales communication in print can do all of this and do it well, if you plan each sales message to do a single sales job—and if you entrust it to a publication you know is read and respected by the men you sell to.

*McGraw-Hill Laboratory of Advertising Performance Reports *8013 and **7020.*



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Certainly your employees, product, and investors deserve maximum, well directed marketing effort. Alert advertising/sales management won't settle for less!

a McGraw-Hill Businesspaper

Electrical World

the electrical industry's weekly magazine

News About People (*Continued from page* 121)

voltage section of the electricity division at the National Bureau of Standards, US Department of Commerce.

James A. Farrell is the new assistant controller at Northern Indiana Public Service Co. He succeeded **Allen P. Good** recently elected vice president and controller.

Corbett McLean has been named to the newly created post responsible for special system engineering problems and **Jack Stiles** became electrical engineering supervisor at Pacific Power & Light Co.

A new consulting engineering firm of Ingledow, Kidd & Associates Ltd has been formed. **Dr Thomas Ingledow** heads the new firm, **K. H. Kidd** is executive vice president, and **A. J. Leighton, D. D. Mears,** and **H. J. Cook** are vice presidents.

Bynum E. Smith has become assistant system superintendent of distribution in the distribution and transmission department of Virginia Electric & Power Co.

W. A. Campbell has resigned as vice president and secretary of Westinghouse Co Ltd to become president of Wallace Barnes Co Ltd.

Robert L. Werner has been elected executive vice president and general attorney of Radio Corp of America.

International Business Machines Corp has elected **Richard H. Bullen** as treasurer, succeeding **Charles V. Boulton,** who left the company for reasons of health. **Harry M. Sibley** became assistant treasurer, and **Kenneth N. Davis Jr** was boosted to controller.

OBITUARIES

Carl C. Ernst, 64, president of California Electric Power Co for the past four years . . . **Anthel W. Isenhart,** 73, retired vice president of Dayton Power & Light Co . . . **Chester Irwin Harrison,** 44, manager of transportation for Kansas City Power & Light Co . . . **Emil J. Crown,** 63, former city utilities director of the City of Cleveland, O . . . **George Mueller,** 58, former Duquesne Light Co employee who organized the 1946 power strike in Pittsburgh . . . **Harry Sohon,** 57, associate professor of electrical engineering at the University of Pennsylvania . . . **Clarence M. Sterner,** 61, supervisor of underground department, Baltimore Gas & Electric Co.

Raasch Gets Sales Post In Copperweld Division

Roy C. Raasch has been chosen to succeed Erich G. Elg as Midwestern sales manager for Copperweld Steel Co's wire and cable division. Elg retires at the end of the year.

Raasch joined Copperweld after seven years' service with Public Service Co of Northern Illinois. Starting as a sales engineer covering several Midwestern states, Raasch has served most recently as Cleveland district manager.

Letters (*Continued from page* 5)

sixth, seventh, eighth, ninth, and tenth place.

FPC in its Bulletin S-149, indicated that OVEC and EEInc were not included in the list because they are wholesale suppliers to AEC. But OVEC is an integrated public utility system generating more electric energy than any other but two systems in the table. And OVEC and EEInc are no more wholesale suppliers than TVA claims to be. . . .

In light of this, the reason given for excluding OVEC from the first position is highly inconsistent.

Philip Sporn, President
Ohio Valley Electric Corp

"Nobody on Spot" With NEAR

To the Editor:

While I recognize the problems raised in the Nov 13 issue with respect to the NEAR system I think the heading of your editorial is most unfortunate. I cannot believe that the President or any reasonable branch of our government has any other motive than to provide a country-wide alarm system with all possible speed. Nobody is being put "on the spot".

Every difficulty you raise in your editorial is sound from the standpoint of normal practice but this is not a normal situation. We are faced with an emergency.

Undoubtedly the system as originally installed will be short of being perfect. It is easily conceivable that within five years, changes will be made that will involve an expenditure that will dwarf the original cost. But who is to put a price on the value of human lives?

Let us not talk about "reckless abandon" or being "on the spot". Let us get to work and do the job as best we can and with all possible speed. If the investor-owned utilities have the talents that you and I believe they have, if they can almost superhumanly rise to emergencies as they so often have in the past, if they sincerely believe in the best possible use of their service regardless, I say "Damn the torpedoes—full steam ahead".

And as a final admonition, let us stop looking at this as a bear trap; let us sincerely and honestly look at it as an opportunity to demonstrate to the American people, and to all the world . . . the electric utilities never give "too little or too late" when the safety of US citizens is at stake.

Samuel B. Williams
Jamestown, Rhode Island

▶ Many readers will recognize the writer as a former chief editor of EW. But we should all recognize that an "emergency" has not been declared. Furthermore, government statements show a succession of policy changes which have needlessly confused the issue. Accordingly we struck at the target's center in asking for speedy definition of national policy, and urged utilities to get ready for their part.

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Automatic Meter Reading Not Just Around Corner

(*Continued from page* 44)

pense value placed on them, on a per-metering-point basis:

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Distribution transformer load analysis and control	0.50
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Based on a capitalization rate of 12½%, these expense credits are worth $17 investment. Added to the $12 maximum value of automatic meter reading, the $29 total still falls short of the $32.16 estimated cost of the system.

High-speed interrogation meter reading offers more than other systems now proposed. But more value must be assigned to the additional functions available with this system to construct an attractive and economic package.

Orients Distribution Computer Data (*Continued from page* 48)

the three phases of a circuit.

Another program produces a phase balance report by using LSD cards, capacitor cards, and one line section header card for each feeder. One card is prepared for each capacitor bank. It contains a complete description of the bank. The cards are also used annually for printing out a complete capacitor inventory.

The phase balance program begins at an "end of line coordinate," reading each electrically successive LSD card. It sums capacitor kva and KVAS or KVAT (whichever is desired), totals and by phases, with subtotals at all junctions, ending at the substation. With this report and the associated primary map, a distribution engineer can determine the phase changes necessary to balance loads along the feeder. He can quickly determine also the proper phase to which each new transformer should be connected, thus maintaining a balanced condition. The computer produces the values for this report at 50 line sections per min and simultaneously produces one line totals card for each line section point on the feeder.

Comprehensive analysis of the performance of each feeder is produced by a program using the line totals cards and one feeder analysis header card (FAH). In this card is recorded the substation bus coordinate, phase-to-neutral voltage, the annual peak kw load on the feeder, 3-phase and single-phase bus reactance, uncorrected power factor, headquarters, and feeder number.

In this program the computer reads the FAH card and all line totals cards in reverse electrical sequence (beginning at the substation). It sums the impedances, reading the wire code and using a table-look-up subroutine to secure impedance values, at each successive line section. These totals complete the data for computer calculations resulting in a feeder analysis report. Computer time to produce an analysis of Feeder No. 84 was 1 min and 39 sec.

Three card forms thus contain the particulars of the entire distribution system: The transformer record card, the line section data card, and the line totals card. From these can be prepared many kinds of reports for commercial as well as engineering and planning studies.

Longer Transformer Use Justifies Capacitors (*Continued from page* 49)

has been developed specifically to overcome the problems of capacitor switching, said C. H. Baker, S&C Electric Co. The principal problem is the charge remaining on capacitors after the circuit has been opened.

The circuit switcher, according to Baker, has two operating rods per phase, a load and a high-speed rod. The former moves to the open position first, and the final circuit opening is accomplished by the high-speed rod, he explained. The rapid opening of the second rod builds up dielectric strength between interrupter contacts fast enough to prevent restrikes.

E. H. Stratton said that Texas Electric Service Co has extended computer calculation to the analysis of distribution feeders, relating loading to feeder section capacity and pinpointing var loads that can be supplied by capacitors. The analysis also spots overloaded conductors and places where voltage needs correction Stratton added.

With a system peak demand of 2,837 Mw in 1961, Duke Power Co has 1,033 Mvar in capacitors and is installing more at the rate of 100,000 kvar per year, said L. F. Meisenheimer. Capacitor installations are coordinated in time and location with generating plant additions, he said. When generation is being added in one section of the system, capacitor additions for that year are made in another.

Use of capacitors, Meisenheimer continued, places the var supply at the load center, thus improving customer voltage and dispensing with var transportation on the lines. At many places, voltage regulators could be omitted.

In summer, when var requirements are heaviest, computer reports supply Oklahoma Gas & Electric Co engineers with information on loads at every pole and transformer and on the voltage at each end of every secondary bus, said P. L. Shelley. Continuous measurements on a few transformers, he added, provide a check on watt and var data used in computer calculations.

Measurements on primary circuits, Shelley said, are made at substations with three indicating thermal maximum-demand ammeters on each circuit, one per phase. The meters are read monthly and the data compiled in a report covering three months. A circuit nearing its load limit, or low primary voltage calls for special one-day, comprehensive tests to determine loads at different feeder points.

Graphic metering of kw and kvar at 89 substations guide capacitor application. The objective, he summed up, is to keep peak-load power factor at 95% and off-peak power factor at 100%. Many fixed capacitors are disconnected manually in winter, when temperature-controlled capacitors go off automatically.

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Meetings Calendar

JANUARY—1962

• **Pennsylvania Electric Association**—Systems Operation Committee, Benjamin Franklin Hotel, Philadelphia, Penn., Jan. 18-19; Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, Penn., Jan. 18-19; Communications Committee, Bellevue Stratford Hotel, Philadelphia, Penn., Jan. 25-26; Structures & Hydraulics Committee, Pick-Roosevelt Hotel, Pittsburgh, Penn., Jan. 25-26.

Public Utilities Advertising Association—Region 9 Meeting, Palm Springs, Calif., Jan. 18-19.

American Society of Mechanical Engineers—Symposium on Thermophysical Properties, Princeton University, Princeton, New Jersey, Jan. 22-26.

• **Canadian Electrical Association**—Eastern Zone Meeting, Sheraton-Brock Hotel, Niagara Falls, Ontario, Jan. 22-25.

Doble Client Conference—29th Annual Conference, Sheraton-Plaza Hotel, Boston, Mass., Jan. 22-26.

Southeastern Electric Exchange—Legal and Claims Committee, Roosevelt Hotel, New Orleans, La., Jan. 24-25.

American Institute of Electrical Engineers—Winter General Meeting, Statler Hotel, New York City, Jan. 28-Feb. 2.

• **Grand Canyon State Electric Cooperative**—Annual Meeting, Adams Hotel, Phoenix, Arizona, Jan. 28.

• **American Society of Heating, Refrigerating and Air-Conditioning Engineers**—Semiannual Meeting, Chase-Park Hotel, St. Louis, Mo., Jan. 29-Feb. 1.

• **Virginia Association of Electric Cooperatives**—Hotel John Marshall, Richmond, Va., Jan. 30-31.

• **Edison Electric Institute**—LBE Women's Conference, Chicago, Ill., Jan. 11-13; LBE Policy Committee, New York City, Jan. 29; AGA-Taxation Accounting Committees, Atlanta Biltmore Hotel, Atlanta, Ga., Jan. 31-Feb. 2.

American Management Association—Session on Industrial Preparedness-Planning for Corporate Continuity and Survival, Astor Hotel, New York City, Jan. 31-Feb. 2.

FEBRUARY

National Association of Purchasing Agents—Public Utility Buyers' Group Meeting, San Francisco, Calif., Feb. 4-6.

• **Hoosier Co-op Clinic**—Purdue Memorial Union Building, Purdue University, Lafayette, Indiana, Feb. 5-6.

• **Edison Electric Institute**—IEC Heating Conference, Cincinnati, Ohio, Feb. 5-8; BLBS Executive Committee, New York City, Feb. 6; AGA-Accounting Conference Final Workshop Meeting, Sheraton Cleveland Hotel, Cleveland, Ohio, Feb. 8-9.

National Industrial Electric Heating Conference—The Netherland Hilton Hotel, Cincinnati, Ohio, Feb. 5-8.

American Public Power Association—Workshop, Peabody Hotel, Memphis, Tenn., Feb. 7-9.

• **Pennsylvania Electric Association**—Relay Committee, Bellevue Stratford Hotel, Philadelphia, Penn., Feb. 8-9; Transmission & Distribution Committee, Penn Sheraton Hotel, Pittsburgh, Penn., Feb. 14-15; Prime Movers Committee, Pick-Roosevelt Hotel, Pittsburgh, Penn., Feb. 15-16; System Planning Committee, Hilton Hotel, Pittsburgh, Penn., Feb. 26-27.

National Electrical Week—Feb. 11-17.

Missouri Valley Electric Association—Industrial & Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 15-16.

• **Electrical Insulation Conference & Exhibits**—Sponsored by AIEE-NEMA, Shoreham Hotel, Washington, D. C., Feb. 19-22.

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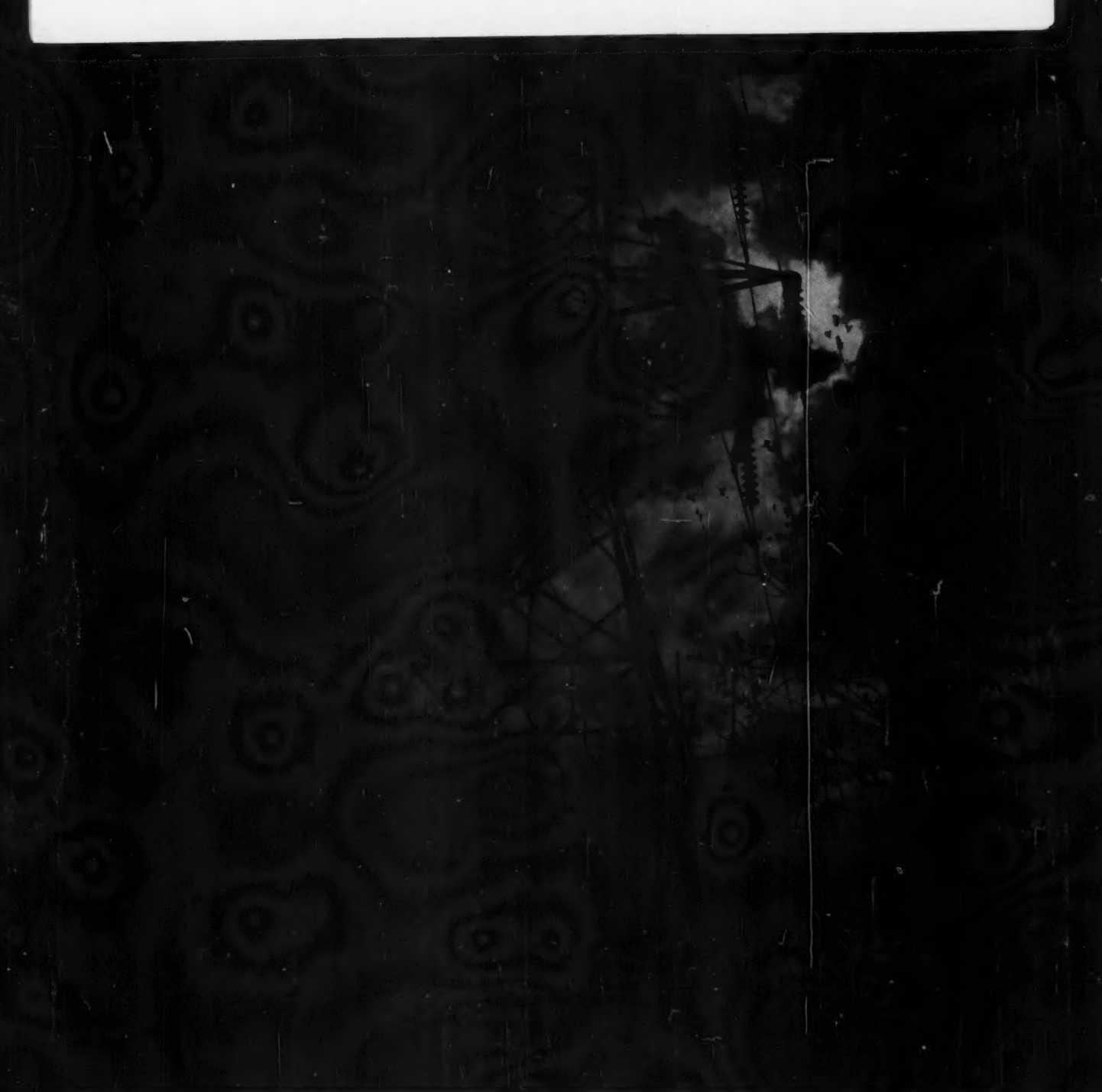

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